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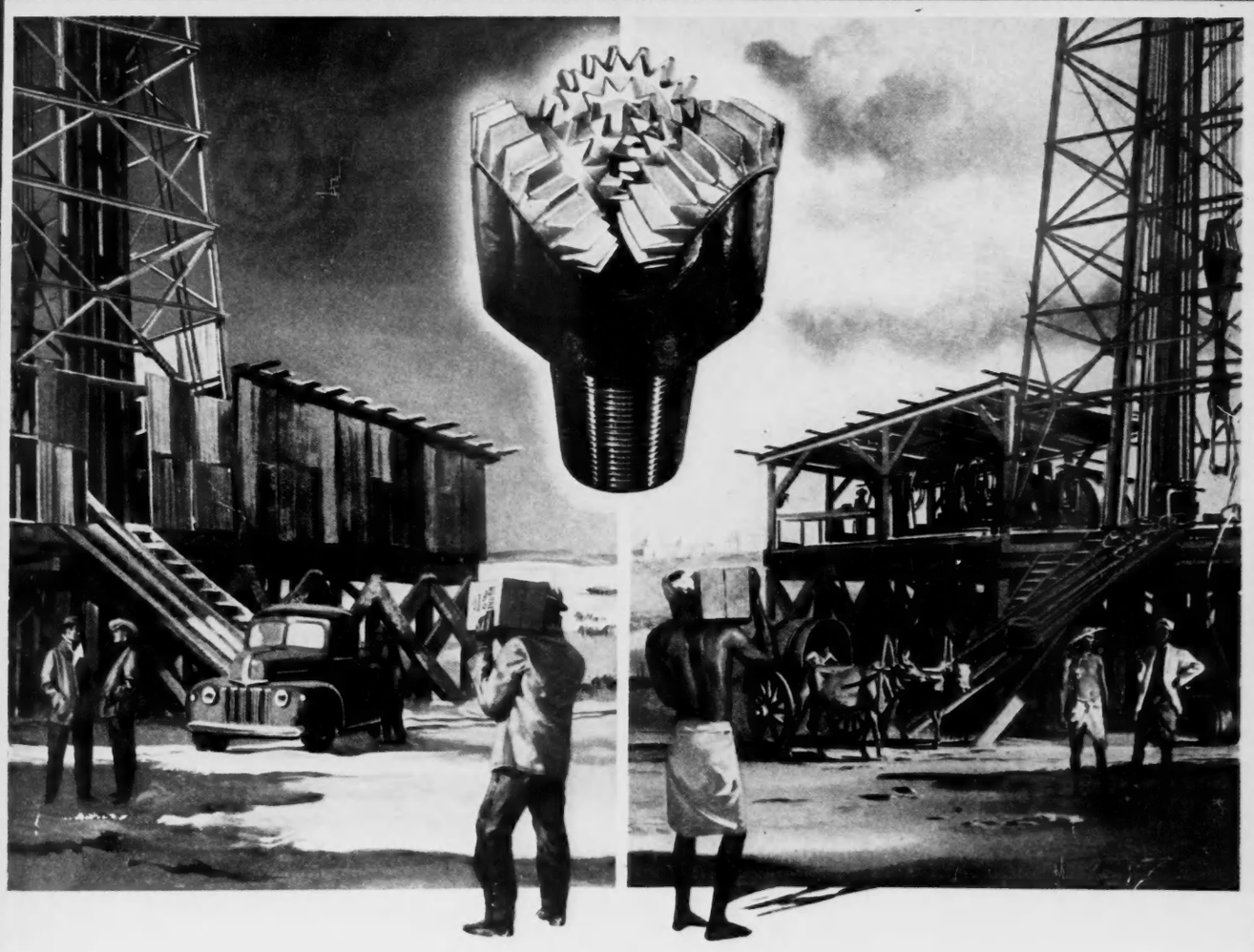
The OIL WEEKLY

1941 WORLD OIL ATLAS



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Published by THE OIL WEEKLY, Houston, Texas

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PETROLEUM REFINER and The REFINERY CATALOG for the refining-natural gasoline industry

DAILY OIL NEWS, published only during annual American Petroleum Institute meetings.

WORLD OIL ATLAS, an annual section of a regular issue of *The Oil Weekly*

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Foreword . . .

DECISION to make the WORLD OIL ATLAS an annual publication—and thus provide a compact and authoritative reference on the rapidly-expanding international petroleum industry—was made when the *Atlas* plan was first conceived, some 15 months before the initial issue appeared in 1946.

Wisdom of that decision was strengthened immeasurably by the whole-hearted acceptance given the ATLAS by the oil industry. If the editors themselves had been asked to comment on the general idea and its execution, they hardly would have dared use the superlatives contained in the voluntary outpouring of praise received after the first issue had been distributed.

We had realized in adopting the program that there was a definite need for a WORLD OIL ATLAS, concentrating within its covers authoritative maps and statistical data dealing with the oil industry's world-wide activities. And we set about gathering the requisite material not unmindful of Herculean proportions of the task assumed. We knew, from experience, of the intracacies and involvements of such a labor if it was to be done in a workmanlike manner. And the 1946 product, being No. 1 of the WORLD OIL ATLAS effort, we were constrained to believe after the tremendous job had been finished, could be termed, perhaps, only "a starter."

But our subscribers decided otherwise. Letters by the score, from all countries of the globe, began to flow in and almost without exception, they declared the 1946 issue a turnkey job, an accomplishment of which the oil industry was both thankful and proud.

Along with the encomiums, which, of course, were truly appreciated, the letters contained many points of criticism which went into the consideration of the 1947 issue. Oil company executives, government officials, and others well informed on subjects dealing with petroleum had incorporated in their letters tips and suggestions that pointed the way to future improvements. All these ideas were considered fully and many were adopted.

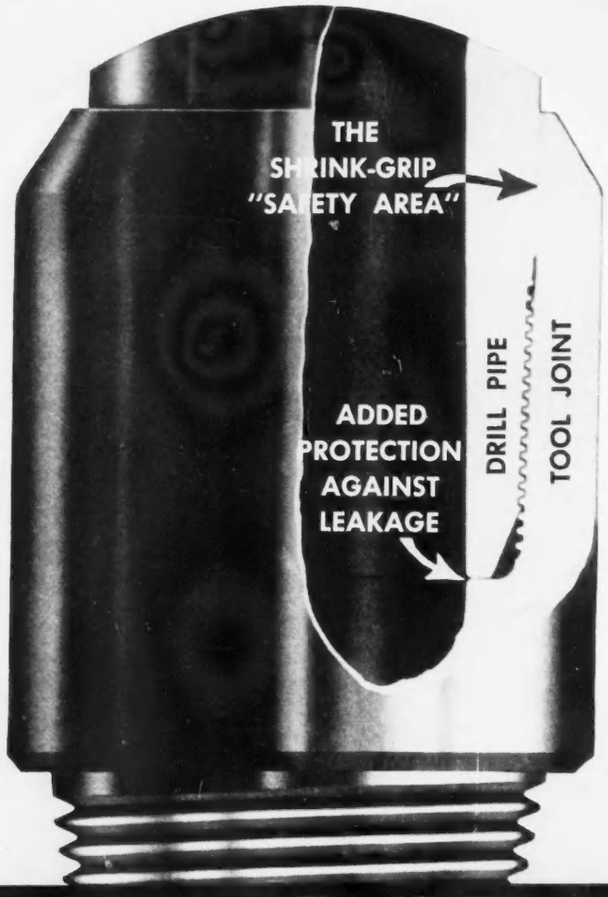
Not only does the second volume, copy of which you are now holding, contain a larger number of maps—the very backbone of world oil presentation—but it contains better and more detailed maps. The statistical data likewise have been broadened and improved. And publication date was set back so as to make the record reflect activities of the full calendar year. Many other changes were carried out, all for the purpose of producing a book that would more perfectly meet world oil needs.

Our continuing aim—and this is a pledge—will be year-to-year improvement to the end that the WORLD OIL ATLAS will satisfy every demand for information on international activities. Suggestions are invited.

Meanwhile, thanks to all who have helped with this year's issue. Without their cooperation, we could not feel half so certain that the oil industry will term the 1947 WORLD OIL ATLAS a definite improvement. Nor could we face the 1948 task—and this work has already commenced—with nearly so much confidence and assurance.

THE EDITORS.

Applied or replaced by hand-ANYWHERE



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1947 WORLD OIL ATLAS

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WORLD PETROLEUM

WORLD demand for petroleum during 1946 was at an all-time peak of 7,762,600 barrels per day, of which 4,906,700 barrels was consumed in the United States and an estimated 2,865,900 barrels by others. This was almost in direct relationship with production, the United States producing 5,070,300 barrels of crude, condensate and natural gasoline while the rest of the world was producing 2,859,200 barrels. However, there was no relationship between the producing and consuming rates of various areas outside the United States, thereby necessitating a large international movement of petroleum between countries.

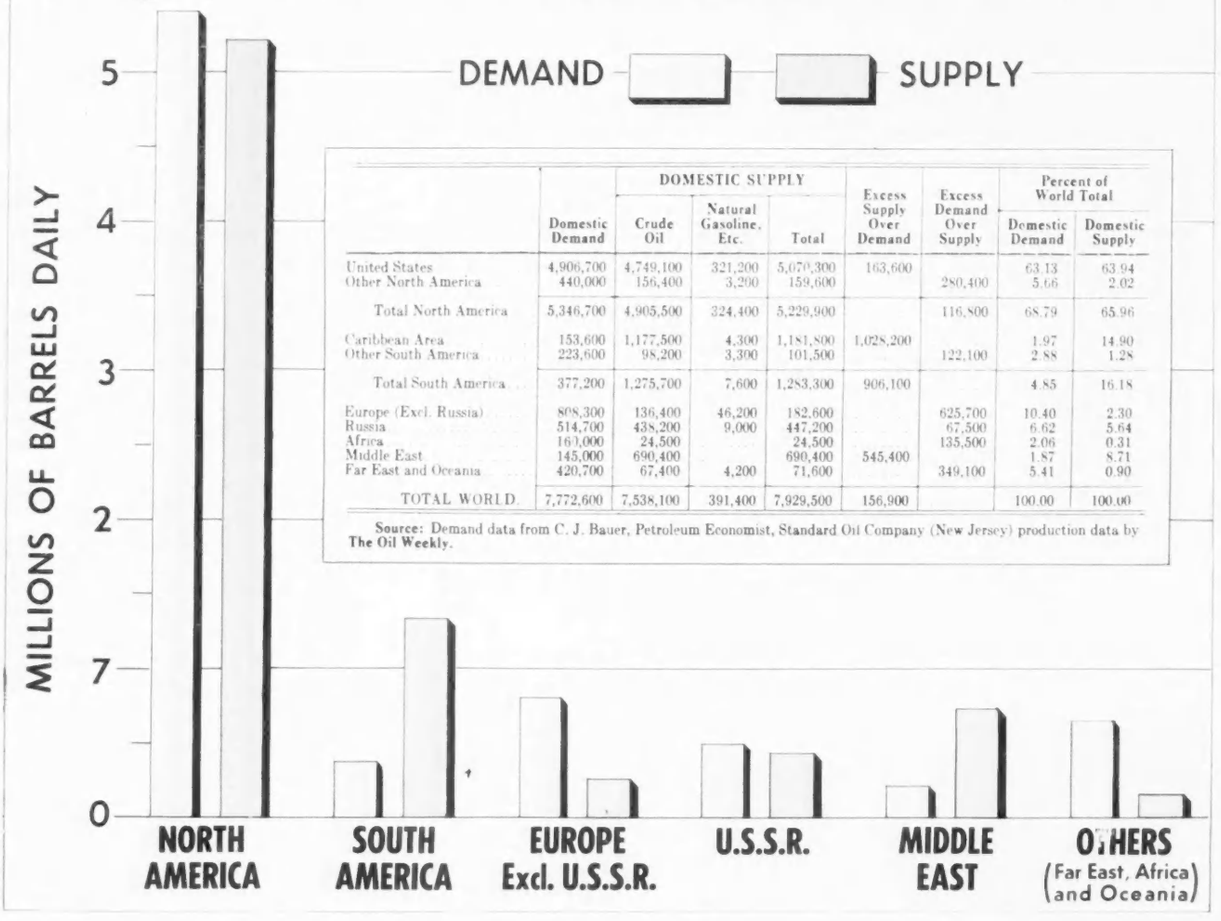
Three areas furnished 87 percent of the world's supply of crude and petroleum products. These three areas were the only large geographical regions of the world to produce more than they consumed. They were the United States, the Caribbean area of northern South America and the Middle East of western Asia. Since these three areas consumed but 67 percent of the oil used by the world, they were able to ship 1,981,800 barrels daily to countries in need of petroleum products. This figure includes both the imports and exports of the United States, these being sizeable volumes. Other countries, of course, participated in the international movement of petroleum products, but only to a small degree.

Significant shifts in the distribution of petroleum supplies have occurred since 1938. The caribbean area, due to an 80 percent gain in volume exported, now exports nearly twice as much oil as any other region. However, the largest increase in export shipments since 1938 has occurred in the Middle East, which in 1946 exported 112 percent more. Meanwhile, exports from the United States declined and imports increased. The greatest change in the movement of oil between 1938 and 1946 was in the East Indies. Due to the destruction of the oil fields and refining facilities, this former sizeable exporting region has been forced almost entirely out of the picture.

These various changes have made the Western Hemisphere more dependent upon Caribbean petroleum as its supply source. Europe also has become more dependent on the Caribbean area. Meanwhile, the Far East, Oceania and Africa have become more dependent upon Middle East oils.

Europe, excluding Russia, is the major shortage area of the world. Its supply of petroleum in 1946 was only 182,600 barrels daily, or 625,700 barrels short of supplying demand. The Far East, combined with Oceania, had the second largest supply deficit, due in large measure to the destruction of the East Indies fields and refineries. The shortage in this area was 349,100 barrels per day. The North American countries outside of the United States ranked next, having a demand that was 280,400 barrels greater than their domestic supply. Africa and South America, excluding the Caribbean area,

PETROLEUM DEMAND AND SUPPLY BY AREAS, 1946



	Domestic Demand	DOMESTIC SUPPLY: Crude Oil	DOMESTIC SUPPLY: Natural Gasoline, Etc.	DOMESTIC SUPPLY: Total	Excess Supply Over Demand	Excess Demand Over Supply	Percent of World Total: Domestic Demand	Percent of World Total: Domestic Supply
United States	4,906,700	4,749,100	321,200	5,070,300	163,600		63.13	63.94
Other North America	440,000	156,400	3,200	159,600		280,400	5.66	2.02
Total North America	5,346,700	4,905,500	324,400	5,229,900		116,800	68.79	65.96
Caribbean Area	153,600	1,177,500	4,300	1,181,800	1,028,200		1.97	14.90
Other South America	223,600	98,200	3,300	101,500		122,100	2.88	1.28
Total South America	377,200	1,275,700	7,600	1,283,300	906,100		4.85	16.18
Europe (Excl. Russia)	808,300	136,400	46,200	182,600		625,700	10.40	2.30
Russia	514,700	438,200	9,000	447,200		67,500	6.62	5.64
Africa	163,000	24,500		24,500		135,500	2.06	0.31
Middle East	145,000	690,400		690,400	545,400		1.87	8.71
Far East and Oceania	420,700	67,400	4,200	71,600		349,100	5.41	0.90
TOTAL WORLD	7,772,600	7,538,100	391,400	7,929,500	156,900		100.00	100.00

Source: Demand data from C. J. Bauer, Petroleum Economist, Standard Oil Company (New Jersey) production data by The Oil Weekly.

DEMAND AND SUPPLY

were the other large consuming areas of the world without adequate petroleum supplies.

The position of the United States in the international movement of oil has changed substantially since 1938. Exports from this country in 1946 amounted to 414,200 barrels daily, a decline of nearly 117,000 barrels from the 530,800 barrels exported in 1938. Meanwhile, imports into the country rose sharply, from 148,800 barrels in 1938 to 370,000 barrels daily in 1946. As a result, this country in 1946 exported only 44,200 barrels more per day than it imported, where as in 1938 it shipped 382,000 more barrels daily than it imported.

The most significant loss in United States export business was to the Far East, a drop of 85 percent occurring due to the decline of the Japanese market. The United States also lost export business in Europe and South America, but showed a good gain in exports to Canada.

The Caribbean area, comprising refineries of the Netherlands West Indies, and fields and refineries of Venezuela, Colombia and Trinidad, is the world's largest surplus area. In 1946, this area had a production of 1,180,800 barrels daily, or 1,028,200 barrels more than it consumed. Exports from the area totaled 1,026,300 barrels per day, up 80 percent from the 568,800 barrels exported in 1938.

The largest customer of the Caribbean area was Europe, which in 1946 took 361,000 barrels, an increase of 76,500 barrels per day or 26.9 percent since 1938. It is important to note that in 1938, half of the Caribbean exports went to Europe whereas in 1945 this had dropped to one-third.

The greatest Caribbean market gain, however, was to the United States. Exports to the United States climbed from 139,700 barrels per day in 1938 to 351,700 barrels in 1946, an increase of 212,000 barrels or slightly more than 150 percent. The Caribbean area also found other South American countries and Canada important customers. It is significant to note that shipments from the Caribbean area to other countries of the Western Hemisphere rose from 239,000 barrels daily to 614,000 barrels a day between 1938 and 1946, an increase of 157 percent.

The Middle East area, embracing Iran, Bahrein, Saudi Arabia, Kuwait and Iraq, showed the largest gain percentagewise of any of the principal exporting areas, although its increase in barrels did not equal the growth attained by the Caribbean area. Exports from the Middle East increased from 254,700 barrels daily in 1938 to 541,300 barrels per day in 1946, or 112 percent.

Largest customer of the Middle East was the Far East, whereas Europe was the area's most important customer in 1938. The Middle East shipped 189,200 barrels daily to the Far East during 1946, compared with 34,200 barrels in 1938. Europe, which in 1938 took 168,600 barrels of Middle East oil daily, imported but 149,700 barrels per day in 1946. Middle East oil also was shipped in large quantities to Oceania. With the East Indies fields and plants destroyed, 121,800 barrels of Middle East oil went to Oceania daily in 1946 in contrast with less than 10,000 barrels daily in 1938.

Additional shifts in supply points are to be expected in the future. Certainly, the East Indies can be expected to regain Oceania markets when fields and plants are restored. The very sizeable expansion anticipated in Middle East production with completion of several large pipe lines during the next four or five years, together with the probable loss of Oceania markets, indicates Middle East oil will be seeking markets in Europe. This means that Caribbean oil will find its market in the Western Hemisphere. World demand, however, has every indication of increasing fast enough to absorb all the prospective growth in supply, although supplies may be 1½ million barrels higher by 1951. Consequently, forthcoming shifts in world oil movement can be made without creating unfavorable economic conditions for the industry in any part of the world.

WORLD MOVEMENT OF CRUDE AND PRODUCTS, 1946

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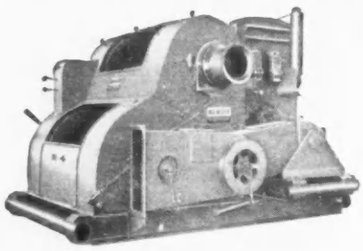

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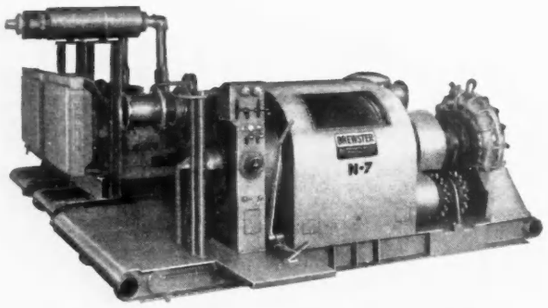

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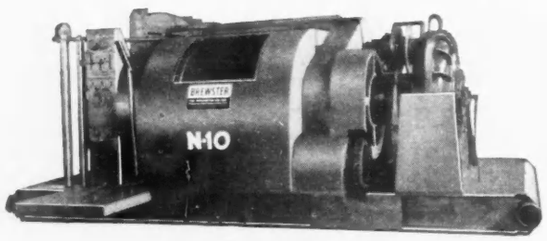

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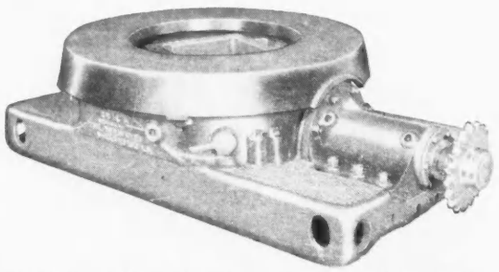
BREWSTER RR 18 and RR 27½ ROTARIES and the BREWSTER RS 18 ROTARY (above) are tough, dependable. RS 18 ROTARY is smooth, silent, because of spiral bevel gear arrangement. All operate in lubricating oilbath.



BREWSTER OB OILBATH ROTARIES

BREWSTER OB OILBATH ROTARIES are rugged, efficient. Three sizes available: Model OB-22, 22" full table opening, Model OB-18, 18" full table opening, Model OB-12, 12" full table opening.

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CONVERSION FACTORS—MONEY VALUES

For Converting U. S. Terms Into Foreign Equivalents

UNITS OF LENGTH

U.S. Terms to Foreign	Foreign Terms to U.S.
1 inch = 2.540 centimeters	1 centimeter = 0.3937 inch
1 foot = .3048 meter	1 meter = 3.2808 feet
1 yard = .9144 meter	1 meter = 1.0936 yards
1 statute mile = 1.609 kilometers	1 kilometer = 0.6214 statute mile

UNITS OF AREA

U.S. Terms to Foreign	Foreign Terms to U.S.
1 square inch = 6.4516 square centimeters	1 square centimeter = 0.1550 sq. inch
1 square foot = 0.0929 square meter	1 square meter = 10.764 square feet
1 square yard = 0.8361 square meter	1 square meter = 1.196 square yard
1 sq. (statute) mile = 2.5900 sq kilometers	1 square meter = 0.000396 acre
1 acre = .00405 square kilometers	1 square kilometer = 0.3861 sq. mile
1 acre = 0.4047 hectares	1 square kilometer = 247.104 acres
1 acre = 4046.87 square meters	1 hectare = 2.471 acres
1 acre (U.S.) = 1 acre (British)	1 acre (British) = 1 acre (U.S.)

UNITS OF VOLUME

U.S. Terms to Foreign	Foreign Terms to U.S.
1 cubic inch = 16.387 cubic centimeters	1 cubic centimeter = .0610 cubic inch
1 cubic foot = .0283 cubic meter	1 cubic meter = 35.314 cubic feet
1 cubic yard = .7646 cubic meter	1 cubic meter = 1.308 cubic yards
1 gallon (American) = 3.785 liters	1 liter = 0.2642 gallon (American)
1 barrel (oil) = 158.99 liters	1 liter = .00629 barrels (oil)
1 U. S. gallon = .8327 Imperial gallon	1 Imperial gallon = 1.201 U. S. gallons
1 barrel (oil) = .15889 cubic meter	1 cubic meter (1000 liters = 6.2897 barrels (oil)

UNITS OF MASS

U.S. Terms to Foreign	Foreign Terms to U.S.
1 ounce = 28.35 grams	1 gram = .0353 ounces
1 pound = .4536 kilogram	1 kilogram = 2.205 pounds
1 short ton = .9072 metric ton	1 metric ton = 1.102 short tons
1 long ton = 1.016 metric tons	1 metric ton = .9842 long tons
1 pound = 0.0277 peed	1 peed = 36.113 pounds

UNITS OF MASS AND VOLUME

U.S. Terms to Foreign	Foreign Terms to U.S.
1 barrel = .1515 short ton 32° oil	1 short ton 32° oil = 6.600 barrels
1 barrel = .1479 short ton 36° oil	1 short ton 36° oil = 6.761 barrels
1 barrel = .1445 short ton 40° oil	1 short ton 40° oil = 6.922 barrels
1 barrel = .1389 long ton 32° oil	1 long ton 32° oil = 7.157 barrels
1 barrel = .1363 long ton 36° oil	1 long ton 36° oil = 7.336 barrels
1 barrel = .1332 long ton 40° oil	1 long ton 40° oil = 7.508 barrels
1 barrel = .1375 metric ton 32° oil	1 metric ton 32° oil = 7.273 barrels
1 barrel = .1342 metric ton 36° oil	1 metric ton 36° oil = 7.453 barrels
1 barrel = .1311 metric ton 40° oil	1 metric ton 40° oil = 7.628 barrels

Other Conversion Factors

Multiply	By	And Obtain
Acres (U.S.)	4046.873	Square Meters
Acres (U.S.)	5645.4	Square Varas
Barrel, Water 60° F. (42 gallon)	.1588	Metric Ton
B.t.u.	0.252	Calories
Calorie	3.968632	B.t.u.'s
Centiliter (Cubic Centimeter)	0.06102	Cubic Inches
Centigrade	1.8 (+32)	Fahrenheit
Centimeter	.033	Feet
Centimeter	.011	Yard
Centimeter, Mercury	.1934	Pounds/Square Inch
Cubic Feet	28.317	Liters
Cubic Inches	.01639	Liter
Cubic Meter	1.308	Cubic Yard
Cubic Meter	264.170	Gallon
Deciliter	6.1023	Cubic Inches
Decimeter	3.9370113	Inches
Dekaliter	2.642	Gallons
Dekaliter	610.2398	Cubic Inches
Dekameter	393.70113	Inches
Fahrenheit −32°	.5556	Centigrade
Feet U.S.	.3699	Vara
Feet U.S.	.0003048	Kilometer
Gallon, Liquid, U.S.	3.785	Cubic Decimeters
Gallon, Liquid, U.S.	.003785	Cubic Meter
Hectare	.003861	Square Mile
Kiloliter (1000 liters)	264.14	Gallon, U.S.
Kiloliter (1000 liters)	35.31	Cubic Feet
Kilometer	3280.83	Feet
Kilogram	.0011023	Ton (Short)
Liter	61.02	Cubic Inches
Liter	2.202	Pounds, Water 62° F.
Meter	3.280843	Feet
Mile, Statute	1900.8	Varas
Millimeter	.03937	Inches
Ounce, Fluid, U.S.	29.5729	Milliliters
Stere	1	Cubic Meter
Stere	35.3105	Cubic Feet
Stere	1.308	Cubic Yard
Ton, Metric	2204.6	Pounds
Ton, Metric	6.297	Barrels Water 60° F. (42 gallons)
Vara	0.309	Feet

Crude Conversion

The U. S. Bureau of Mines uses the factors shown below to convert crude petroleum from metric tons to barrels of 42 gallons each (based on latest data available for each country).

Country	Bbls. per Metric Ton
Albania	6.672
Argentina	7.022
Austria	6.776
Bahrein Islands	7.328
Bolivia	7.716
British Borneo:	
Brunei	7.229
Sarawak	6.654
Canada	7.766
Colombia	7.031
Czechoslovakia	6.770
Ecuador	7.585
Egypt	7.003
France	7.129
Germany	6.993
Hungary	7.536
India	7.240
Iran	7.566
Iraq	7.481
Italy	7.652
Japan	7.030
Mexico	7.166
Netherlands East Indies	7.785
Peru	7.539
Poland	7.419
Romania	7.430
Saudi Arabia	7.417
Trinidad	7.080
U. S. S. R.:	7.266
Sakhalin	6.820
United States	7.401
Venezuela	6.842

Miscellaneous

1 hectare = 10,000 square meters.
1 acre = 840 square yards.
1 section = 640 square meters.
1 section = 1 square mile.
1 township = 36 square miles.
1 statute mile = .8684 nautical mile.
1 nautical mile = 1.152 statute miles.

$$\text{Specific Gravity} = \frac{141.5}{131.5 + \text{API}}$$

$$\text{API} + 131.5 = \frac{141.5}{\text{Specific Gravity}}$$

$$\text{API} = \left(\frac{141.5}{\text{Specific Gravity}}\right) - 131.5$$

Products Factors

For petroleum refined products the factors shown below are used by the U. S. Bureau of Mines to convert to barrels of 42 gallons each.

Type of Product	Bbls. per Metric Ton
Liquefied Petroleum Gases	11.8
Casinghead Gasoline	10.00
Aviation Gasoline	9.00
Motor Gasoline	8.50
Kerosine	7.75
Gasoil, Diesel Oil	7.25
Distillate Oil	7.25
Residual Fuel Oil	6.66
Lubricating Oils	7.00
Benzol	7.14
Mineral Spirits	8.40
Paraffin Wax	7.87
Petrolatum	7.87
Grease	6.30
Asphalt and Road Oil	6.06
Petroleum Coke	5.50

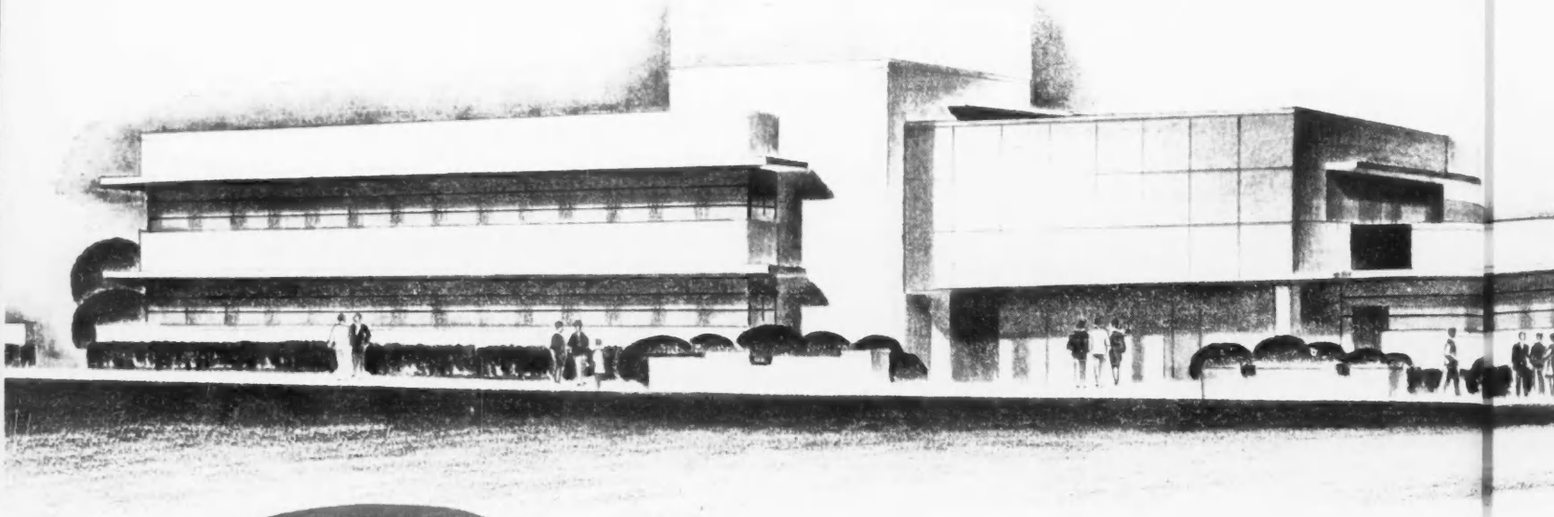
Foreign Exchange Rates

Compiled in the Areas Branch, Office of International Trade, U. S. Department of Commerce, from rates reported by the Federal Reserve Board.

COUNTRY	Monetary Unit	Type of Exchange	Rate	Date
Argentina	Paper peso	Preferential	$ 3.73	March 31, 1947
		Ordinary	4.23	March 31, 1947
		Auction	4.94	March 31, 1947
		Freemarket	4.11	March 20, 1947
Austria	Schilling		[a].1000	March 28, 1947
Bahrein Island	Rupee		.3015	March 28, 1947
Bolivia	Boliviano	Controlled	42.42	March 31, 1947
		Curb	59.00	Feb. 28, 1947
Borneo	Guilder		.3770	March 28, 1947
Brazil	Cruzeiro	Official	[1]	March 31, 1947
		Free Market	18.72	March 31, 1947
		Special Free M'k't	[2]	March 31, 1947
Burma	Rupee		.3015	March 28, 1947
Canada	Dollar	Official	1.0000	April 4, 1947
		Free	.9234	April 4, 1947
Chile	Peso	Special	19.37	March 31, 1947
		Export Draft	25.00	March 31, 1947
		Free Market	42.94	Feb. 28, 1947
		"D. P."[3]	31.00	March 31, 1947
Colombia	Peso	Commercial Bank	1.755	Feb. 29, 1947
		Bank of Republic	1.755	March 31, 1947
		Curb	1.925	Dec. 31, 1946
Cuba	Peso	Free	1.00	March 31, 1947
Ecuador	Sucre	Central Bank (Official)	13.50	March 31, 1947
Egypt	Egyptian pound		[b]4.1400	March 28, 1947
France (metropolitan)	Franc		.0084	April 4, 1947
Germany	Reichsmark		[c].1000	March 28, 1947
India	Rupee		.3016	April 4, 1947
Iran	Rial		.0318	March 28, 1947
Iraq	Dinar		[d]4.0273	March 28, 1947
Japan	Yen		[c].0200	March 28, 1947
Kuwait	Rupee		.3015	March 28, 1947
Mexico	Peso	Free	4.86	March 31, 1947
Netherlands East Indies	Guilder		.3770	March 28, 1947
Peru	Sol	Official	6.50	March 31, 1947
Poland	Zloty		[c].0100	March 28, 1947
Roumania	Leu		not available	
Sarawak, Brunei, N. Borneo	Straits Settlement Dollar		.47125	Oct. 30, 1946
Saudi Arabia	Rival		.3000	March 28, 1947
United Kingdom	Pound	Official	not available	
		Free	4.0274	April 4, 1947
U.S.S.R.	Ruble		[f].1887	March 28, 1947
Venezuela	Bolivar	Controlled	3.35	March 31, 1947
		Free	3.35	March 31, 1947

Note: Unless otherwise specified, rates are in dollars per unit of foreign currency and are based on daily quotations of noon buying rates in New York city for cable transfers.

[a] Official rate. [b] Approximate. [c] Military rate. [d] Same rate as for pound sterling of Great Britain. [e] Effective rate. [f] Official rate for foreign trade valuation only. [1] Official market rate abolished July 22, 1946. [2] Special free market abolished effective February 28, 1946. [3] Disponibilidades propias (private funds).



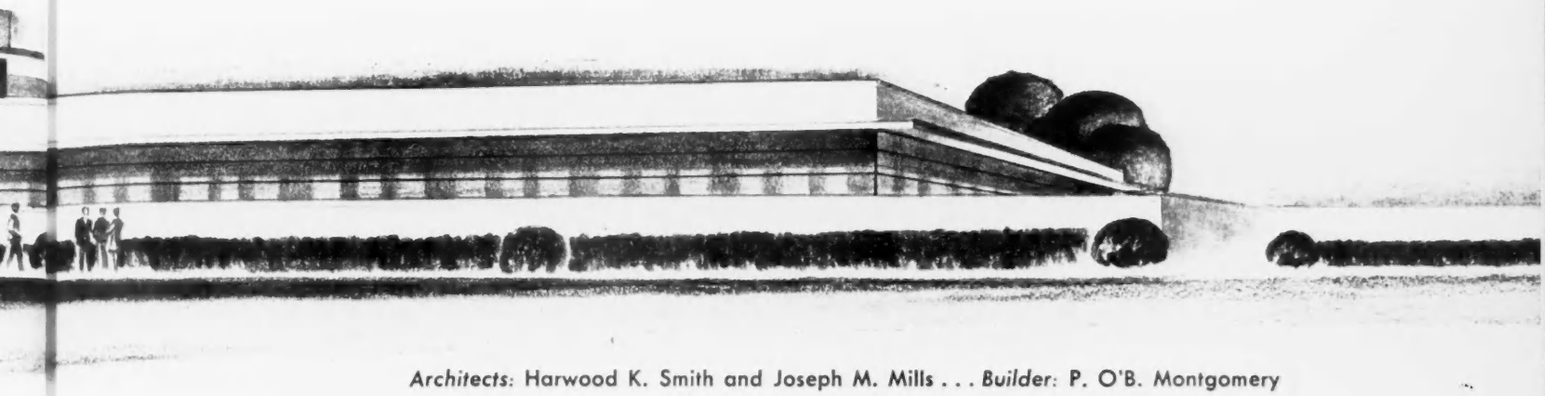
Building FOR THE FUTURE

We of GSI have spent seventeen years building the best organization we knew how to build. But we lacked one important thing—a home of our own. Now we have it.

A building such as we picture here is much more than steel, masonry, wires and plumbing. It's the place where those of us who headquarter in Dallas spend more than half our waking hours. It is where management policies are set, research undertaken, engineering accomplished. Here materials, equipment and supplies are bought for use or shipment where needed. Here our new seismographs will be built, tested and maintained. Here new personnel will be employed and trained for tasks in laboratories, shops or field. Here new crews will be assembled, and to this point they will return when their work is done.

In the paragraphs to follow we include some descriptive data. But we thought that, more than in description, you'd be interested to know how we of GSI *feel* about our new home. To us it's a symbol of our faith and confidence in our country, our industry, and ourselves.

Come and visit us. You'll find the main entrance and reception area in the center. The general management and supervisory offices are on the second floor. Below are an employees' lounge and the electronic instrument assembly and test shops. To the right the long single-story wing houses the library, physical, electronic, and mechanical labora-



Architects: Harwood K. Smith and Joseph M. Mills . . . *Builder:* P. O'B. Montgomery

tories . . . the engineering, purchasing, and plant administrative offices. Behind these for 200 feet stretch the machine shop, warehouse, automotive and rotary drill departments; paint and steam cleaning shops; and the receiving and shipping docks.

Altogether we have 40,000 square feet of plant on seven acres in Dallas' Airlawn Industrial Park. Our building's steel framework is anchored to concrete piers extending to solid rock. Its walls are of limestone, granite and brick. Ample light comes from continuous steel windows. Air conditioning brings comfort and precision to offices, laboratories and instrument shops, while acoustic plaster reduces the distraction of noise.

We designed and constructed this building to satisfy the exacting requirements of a company employing its every skill in the day-to-day applications of geophysics and in longer range programs of research and development.

Once again we invite you to visit us. We know you'll be interested not only in what physical things and processes are here but in that old-fashioned sight, "men at work—and working together."

GEOPHYSICAL SERVICE INC.

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- Corrosion Preventive Compounds
- Demulsifiers and Surface Tension Depressants for use in Acidizing of Formations
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- Paraffin Solvents
- Corrosion Inhibitors for Oil Wells
- Cleaning Compounds

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- Desalting Chemicals and Processes
- Water Clarification Chemicals
- Surface Tension Depressants and Inhibitors for use in Acid Treatments
- Demulsifiers for Petroleum and Waste Oil Emulsions
- Demulsifiers and Foam Preventers for use in Doctor Treating and other Sweetening Solutions
- Lubricating Oil Additives
- Corrosion Preventive Compounds
- Cleaning Compounds

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SAN ANTONIO, (5) TEXAS
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Coalinga, Phone 350
Santa Maria, Phone 1427W
Taft, Phone 93
Ventura, Phone 5203

ILLINOIS
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Mt. Vernon, Phone 227
Olney, Phone 181

KANSAS
Eldorado, Phone 1600
Great Bend, Phone 183 or 869
Hays, Phone 217
McPherson, Phone 1775
Russell, Phone 824
Wichita, Phone 4-8314

KENTUCKY
Henderson, Phone 4354

LOUISIANA
Broussard, Phone 9504
Jena, Phone Goodpine 76
Lafayette, Phone 531
Lake Charles, Phone 4938
Ruston, Phone 532

MICHIGAN
Mt. Pleasant, Phone 31-141

MISSISSIPPI
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Jackson, Phone 4-6357

NEW MEXICO
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OHIO
Lakewood, Phone 2805

OKLAHOMA
Ada, Phone 1181-W
Duncan, Phone 487
Oklahoma City, Phone 5-1088 or 9-5424
Shawnee, Phone 3693
Wewoka, Phone 488
Wilson, Phone 63

TEXAS
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Amarillo, Phone 8935
Beaumont, Phone 2-1522
Corpus Christi, Phone 6927
Dallas, Phone Riverside 4530
Edna, Phone 317
Houston, Phone Woodcrest 6-7457
Kingsville, Phone 1336
Levelland, Phone 115
Longview, Phone 803 or 1803
Midland, Phone 1446
Odessa, Phone 887
San Antonio, Phone Cathedral 9871
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WORLD OIL POSSIBILITIES

THE world faces relatively bright possibilities for discovering additional petroleum supplies. The prospects are such as to indicate new discoveries should easily provide an adequate supply for many years to come, although requirements undoubtedly will increase sharply in coming years.

A comparatively large part of the world is considered favorable for the occurrence of petroleum, being underlain with formations likely to contain oil. It is estimated that approximately 6 million square miles of the earth's surface are prospective oil territory, of which about 1.2 million square miles are in the United States and 4.8 million square miles in other countries.

Different parts of the world offer varied prospects for the future discovery of oil, there being a great unevenness in the distribution among countires and even continents. Both the North American and South American continents are well endowed with additional petroleum possibilities. Europe has only small prospects for prolific production outside of Russia. Parts of Asia have great potentialities, especially in the Middle East region surrounding the Persian Gulf. Africa and Australia have very limited possibilities.

The most promising areas in the world for the development of additional oil production are considered to be:

a) The Mid-Continent and Gulf Coast regions of the United States.

b) The Middle East region of Asia, consisting of Saudi Arabia, Iran, Iraq and Kuwait.

c) Certain areas in Russia, especially the Caucasian or Caspian region and the Ural-Volga and Kama River regions along the western slope of the Ural Mountains.

d) The northern part of South America, extending from Trinidad through Venezuela into Colombia.

Experience and geological studies indicate very great deposits of oil exist in the above regions. These are the areas which will supply much of the world's future oil supply.

Next in importance are those areas where large deposits of oil are likely to be found in the future. These include: California and the Rocky Mountain area of the United States, Mexico and Southwestern Canada in North America; Peru and Trinidad in South America; parts of Russia in both Europe and Asia; Roumania in Europe; and the Netherlands East Indies.

It is notable that the continent of Europe, with the exception of Russia, appears to have only Roumania as a possible source for large oil production and there is considerable question about the proper classification of Roumania. Some geolgists are inclined to rate Roumania's prospects no higher than the "locally important" group. This is quite significant since Europe is second only to the United States in petroleum consumption, and thus must depend upon heavy imports.

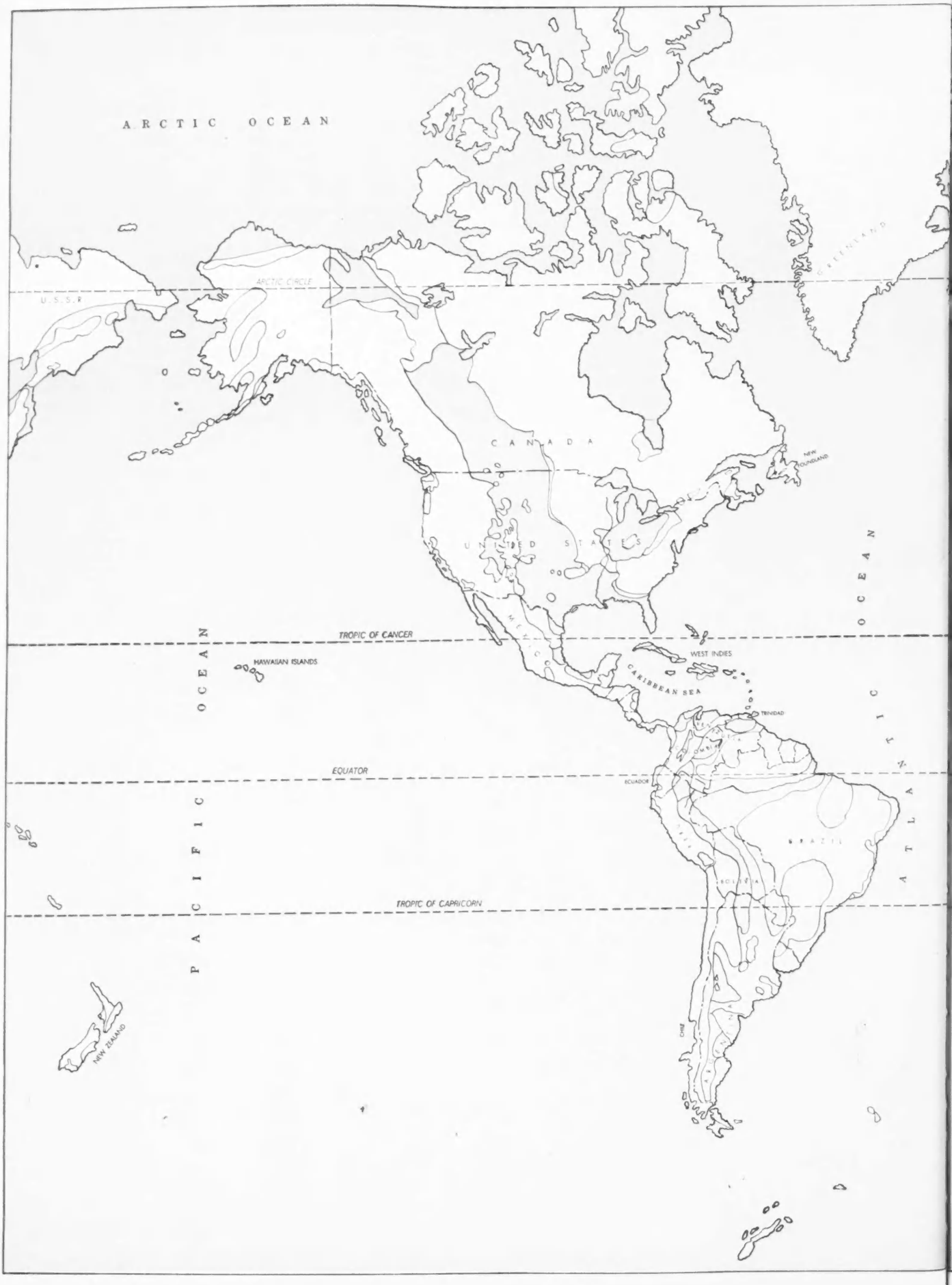
World's Future Prospects for Discovering Additional Oil

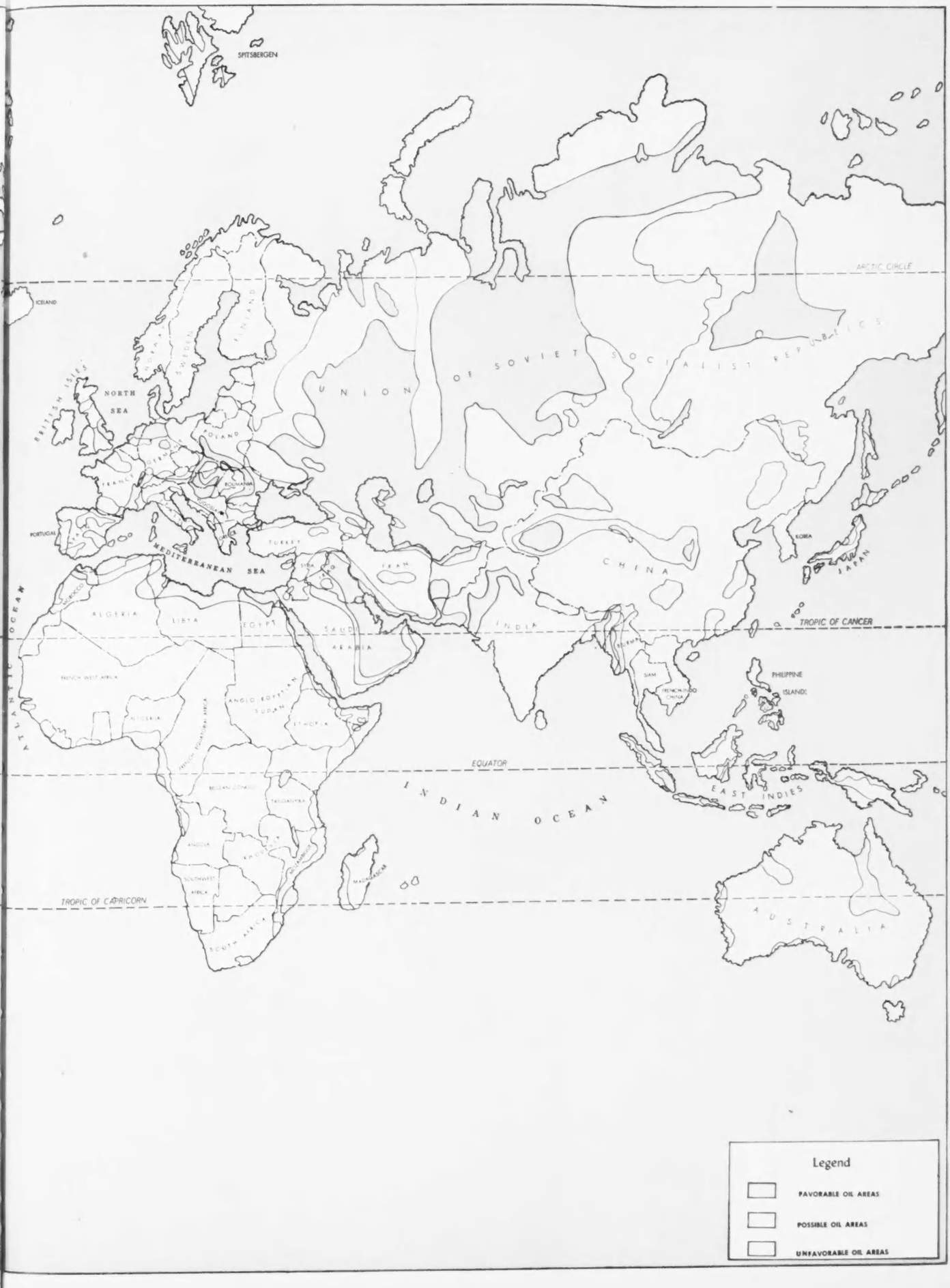
Rating of Evaluations: 1. Very Great; 2. Large; 3. Locally Important; 4. Small; 5. Poor

COUNTRY	Evaluation of Future Prospects
North America:	
Alaska	Small
Canada:	
Eastern Half	Small
Northwestern	Locally Important
Southwestern	Large
Central America	Small
Mexico:	
Baja California	Small
Central East Coast	Large
Isthmus	Locally Important
Northeastern Coast	Small
United States:	
Eastern	Locally Important
Gulf Coast	Very Great
West Coast	Large
Mid-Continent	Very Great
Rocky Mountains	Large
West Indies	Small
South America:	
Argentina:	
Northern	Locally Important
Southern	Large
West Central	Locally Important
Bolivia	Locally Important
Brazil	Small
Chile	Small
Colombia:	
Central	Very Great
Northern	Very Great
Southern	Large
Eastern	Large
Ecuador	Locally Important
Guiancas	Poor
Paraguay	Locally Important
Peru	Large
Trinidad	Large
Uruguay	Poor
Venezuela:	
Central	Very Great
Eastern	Very Great
Western	Very Great
Europe:	
Albania	Small
Austria	Locally Important
Bulgaria	Poor
Czechoslovakia	Small
Denmark	Small
England	Small
Finland	Poor
France	Small
Germany	Locally Important
Greece	Poor
Hungary	Locally Important
Italy	Small
Norway	Poor
Poland	Locally Important
Portugal	Poor
Roumania	Large

COUNTRY	Evaluation of Future Prospects
Europe—Continued:	
Spain	Small
Sweden	Poor
Switzerland	Poor
Yugoslavia	Small
U.S.S.R. (Russia):	
Europe:	
Baku Region	Very Great
Emba Basin	Large
Esteria	Small
Kama River	Very Great
Arctic	Large
Ukraine-Former Poland	Locally Important
Ural-Volga (Perm Basin)	Very Great
Asia:	
East Ural	Large
Arctic	Locally Important
Sakhalin Island	Large
Turkmen Region	Very Great
Tadzik-Kirgiz-Uzbek (Fergana Region)	Large
Africa:	
Angola	Small
Egypt	Locally Important
Algeria	Small
Madagascar	Small
Morocco	Small
Mozambique	Small
Tunisia	Small
Other Africa	Poor
Asia—Middle East:	
Afghanistan	Locally Important
Bahrein Island	Locally Important
Iran	Very Great
Iraq	Very Great
Kuwait	Very Great
Lebanon	Small
Palestine	Small
Oman	Small
Qatar	Large
Saudi Arabia	Very Great
Syria	Locally Important
Trucial Oman	Large
Turkey	Small
Asia—Far East:	
Burma	Locally Important
China	Small
East Indies:	
British (Brunei and Sarawak)	Small
Netherlands (Borneo, Java, Ceram and Sumatra)	Large
French Indo-China	Poor
India	Locally Important
Japan	Small
Philippines	Small
Siam	Poor
Oceania:	
Australia	Small
New Guinea	Small
New Zealand	Small

WORLD PETROLEUM PO




SPITSBERGEN
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ICELAND
BRITISH ISLES
NORTH SEA
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SWEDEN
FINLAND
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OF SOVIET SOCIALIST REPUBLICS
POLAND
FRANCE
PORTUGAL
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TURKEY
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KOREA
JAPAN
ALGERIA
LIBYA
EGYPT
SAUDI ARABIA
INDIA
TROPIC OF CANCER
PHILIPPINE ISLANDS
FRENCH WEST AFRICA
NIGERIA
ANGLO-EGYPTIAN SUDAN
ETHIOPIA
EQUATOR
INDIAN OCEAN
EAST INDIES
TROPIC OF CAPRICORN
AUSTRALIA
Legend
FAVORABLE OIL AREAS
POSSIBLE OIL AREAS
UNFAVORABLE OIL AREAS

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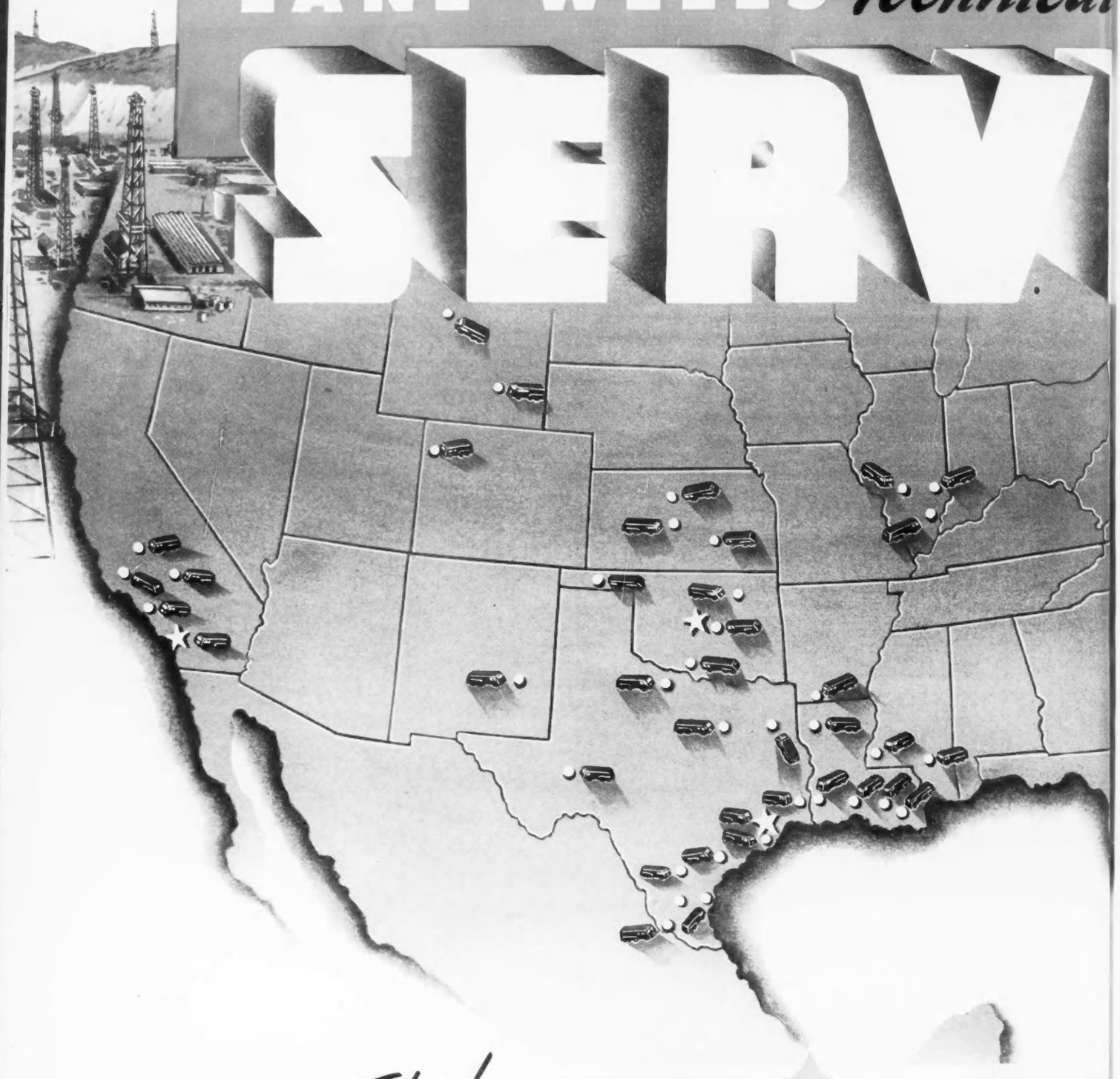
SERV



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- Odessa
- Victoria
- Wichita Falls

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- Casper
- Cody

WORLD CRUDE PRODUCTION

EXCEEDING all expectations, world crude oil production during 1946 rose to a new peak and attained a level of slightly more than 6 percent greater than in 1945, with indications pointing to a materially larger output during 1947 and subsequent years as production expands to meet increased refining and distribution facilities.

World production of crude oil in 1946 was 2,751,401,000 barrels, a daily average of 7,538,085 barrels. Thus in comparison with 1945, the increase was 158,138,000 barrels for the year or 433,255 barrels daily, a gain of slightly more than 6 percent.

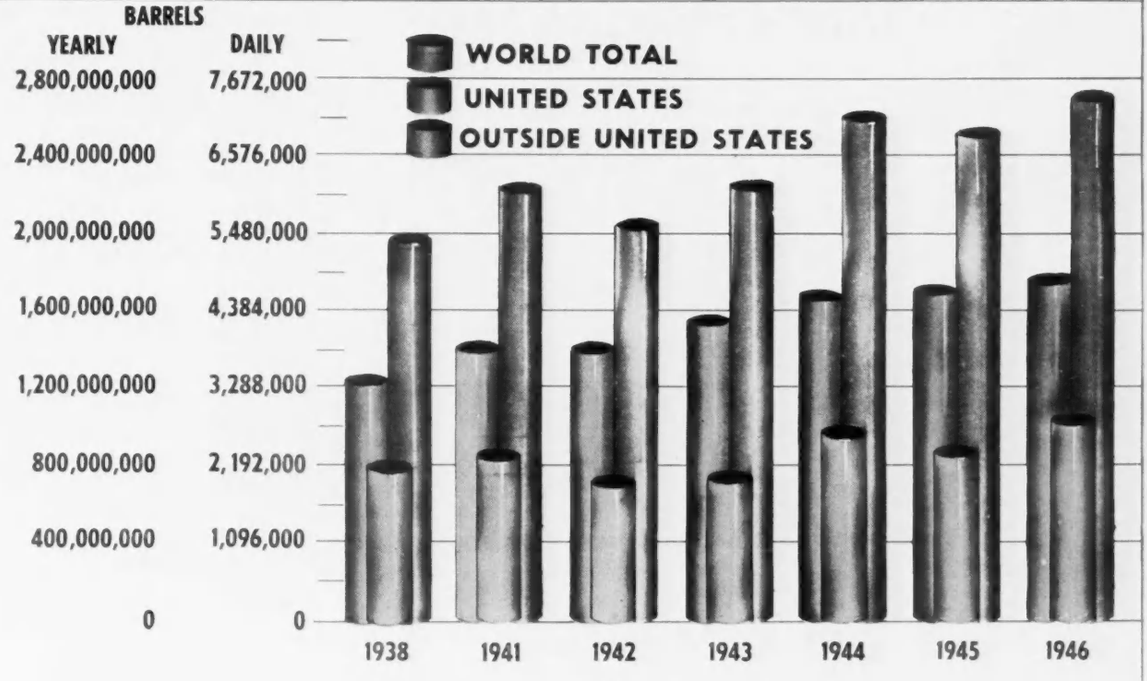
The sharp advance in global petroleum production was attained largely through output records set in the Middle East and the Caribbean sector, as well as the United States.

Almost 94 percent of the world's petroleum output in 1946 was concentrated in four areas—the United States, the Caribbean area (Venezuela, Colombia and Trinidad), the Middle East, and Soviet Russia. In 1941, these four areas produced 89.5 percent of the world's petroleum with the percentage gain between 1941 and 1946 being registered in the Caribbean and Middle East areas. A comparison of the daily production of these four areas and the rest of the world for the years 1941 and 1946 follows:

AREA	Barrels Daily		Percentage of World Total	
	1941	1946	1941	1946
United States	3,841,721	4,749,107	63.1	63.00
Caribbean Area (Venezuela, Colombia, Trinidad)	749,285	1,177,482	12.3	15.62
Middle East	204,195	690,449	3.4	9.16
Soviet Russia	652,466	438,227	10.7	5.81
Rest of World	642,582	482,820	10.5	6.41
World Total	6,090,249	7,538,085	100.0	100.00

There is a possibility that petroleum production in 1947 will reach 8 million barrels daily for the first time in history. This is indicated by the fact that at the end of 1946 the Middle East countries of Iran, Iraq, Kuwait, Saudi Arabia and Bahrein Island, were producing about 50,000 barrels daily more than their average combined daily output in 1946. Also, Venezuela's production at the end of 1946 was 60,000 barrels daily greater than its 1946 daily average. These rates are apt

WORLD CRUDE OIL PRODUCTION



All Figures in Barrels

YEAR	WORLD		UNITED STATES		OUTSIDE U.S.A.	
	Annual Total	Daily Average	Annual Total	Daily Average	Annual Total	Daily Average
1938	1,988,041,000	5,446,000	1,214,355,000	3,327,000	773,686,000	2,119,000
1939	2,086,160,000	5,715,500	1,264,962,000	3,465,600	821,198,000	2,249,900
1940	2,149,821,000	5,873,800	1,353,214,000	3,697,300	796,607,000	2,176,500
1941	2,222,941,000	6,090,200	1,402,228,000	3,841,700	820,713,000	2,248,500
1942	2,079,866,000	5,698,300	1,386,645,000	3,799,100	692,221,000	1,899,200
1943	2,231,423,000	6,113,500	1,505,613,000	4,125,000	725,810,000	1,988,500
1944	2,614,345,000	7,143,000	1,677,904,000	4,584,400	936,441,000	2,558,600
1945	2,593,263,000	7,104,830	1,711,103,000	4,687,953	882,160,000	2,416,877
1946	2,751,401,000	7,538,085	1,733,424,000	4,749,107	1,017,977,000	2,788,978

WIGGINS HIDEK FLOATING ROOF

WIGGINS BALLOON ROOF

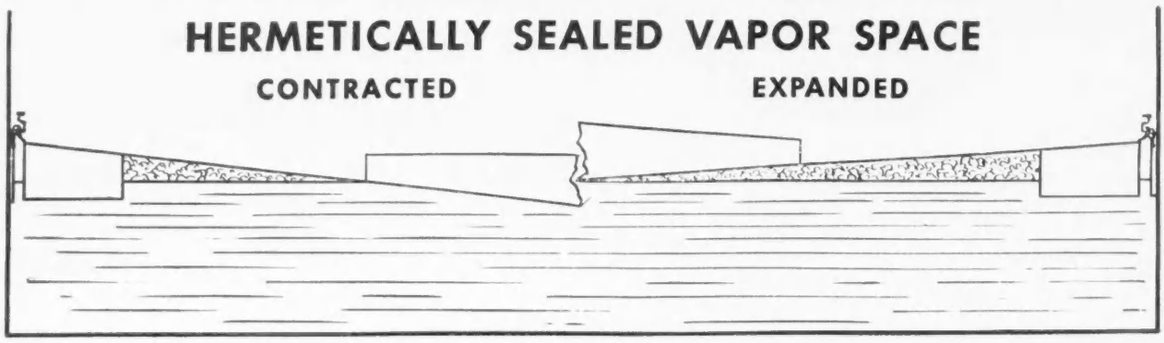
WIGGINS BREATHER ROOF

WIGGINS DRY SEAL LIFTER ROOF

WIGGINS DRY SEAL GAS HOLDER

WIGGINS HIDEK FLOATING ROOFS

HERMETICALLY SEALED VAPOR SPACE



BREATHING but NO VENTING

The sketch above shows the exclusive breathing (the center portion of the roof rising and falling like a gasholder or steel balloon) by which the trapped vapors expand and contract without venting.

This vapor space provides insulation for the oil surface, — preventing boiling and being hermetically sealed eliminates atmospheric moisture and air — preventing corrosion.

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CANADA: Toronto Iron Works, Ltd., Toronto

WIGGINS GATX GENERAL AMERICAN VAPOR SEALS

WORLD CRUDE PRODUCTION—Continued

to be enlarged before the year is over. Other countries were producing at higher rates at the end of the year. The United States should produce about 150,000 barrels more oil daily in 1947 than it did in 1946. Production facilities in the East Indies are being placed back into operation as fast as possible and the output of the fields in that area undoubtedly will show a sharp advance during 1947.

Some have expressed fear that the prospective sharp growth in world production will create surplus stocks. However, if world consumption continues expanding at its recent swift pace, there will be sufficient demand to absorb the increase.

Although production in the United States climbed to a new peak during 1946, the output of the remainder of the world was up much more sharply. While United States' flow was boosted 22,321,000 barrels annually and 61,154 barrels daily, or slightly more than one percent, the remaining countries' output advanced 135,817 barrels during the year and 371,255 barrels daily, or almost 16 percent.

Twenty-one of the world producing areas produced more oil in 1946 than in 1945. The region experiencing the greatest boost was the Middle East which produced an average of 690,449 barrels daily. This was 184,350 barrels daily, or about one-third more than in 1945.

First actual production in Kuwait was in June of 1946 and for the remainder of the year this country produced 5,990,000

Trends in World Crude Oil Production

(Production figures are from U. S. Bureau of Mines except those for 1945 and 1946, which are from authoritative private sources or estimated by The Oil Weekly)

Continent and Country	ANNUAL PRODUCTION (Thousands of Barrels)			DAILY AVERAGE PRODUCTION (Actual Barrels)				YEAR'S PRODUCTION AS PERCENT OF WORLD			CUMULATIVE PRODUCTION TO JANUARY 1, 1947 (Thousands of Barrels)	
	1938	1945	1946	1938	1945	1946	% Diff. 45–46	1938	1945	1946	Total	As % of World
NORTH AMERICA—												
Canada	6,966	8,538	7,565	19,085	23,392	23,726	+ 11.4	0.35	0.33	0.27	121,185	0.24
Mexico	38,506	43,547	49,235	105,496	119,307	134,890	+ 13.1	1.94	1.68	1.79	2,234,209	4.30
United States	1,214,355	1,711,103	1,733,424	3,327,000	4,687,953	4,749,107	+ 1.3	61.08	65.98	63.00	33,223,335	64.01
Other North America	78	172	268	214	471	734	+ 55.8	0.01	0.01	0.01	1,565	
Total North America	1,259,905	1,763,360	1,790,492	3,451,795	4,831,123	4,905,457	+ 1.5	63.38	68.00	65.08	35,580,294	68.57
SOUTH AMERICA—												
Argentina	17,076	22,881	20,594	46,784	62,688	56,422	− 10.0	0.86	0.88	0.75	366,638	0.71
Bolivia	226	406	346	619	1,112	948	− 14.7	0.01	0.02	0.01	3,459	0.01
Brazil		79	67		216	184	− 14.8				342	
Colombia	21,582	22,802	22,062	59,129	62,471	60,444	− 3.2	1.09	0.88	0.80	392,944	0.75
Ecuador	2,246	2,664	2,367	6,153	7,299	6,485	− 11.2	0.11	0.10	0.09	38,968	0.08
Peru	15,839	13,744	12,456	43,395	37,655	34,126	− 9.4	0.80	0.53	0.45	344,839	0.66
Trinidad	17,737	21,993	20,233	48,594	57,789	55,433	− 4.1	0.89	0.81	0.73	331,216	0.64
Venezuela	188,174	323,156	387,486	515,545	885,359	1,061,605	+ 19.9	9.46	12.43	14.05	3,595,727	6.93
Total South America	262,880	406,825	465,611	720,219	1,114,589	1,275,647	+ 14.4	13.22	15.65	16.88	5,074,133	9.78
EUROPE—												
Albania	752	750	725	2,060	2,055	1,986	− 3.4	0.04	0.03	0.03	9,923	0.02
Austria	383	3,059	5,636	1,049	8,408	15,441	+ 83.6	0.02	0.12	0.20	41,194	0.08
Czechoslovakia	130	188	203	356	515	556	+ 8.0	0.01	0.01	0.01	3,831	0.01
France	518	113	233	1,406	310	638	+105.8	0.02		0.01	13,387	0.02
Germany	3,861	3,771	4,634	10,578	10,332	12,696	+ 22.9	0.19	0.15	0.17	87,210	0.17
Great Britain		529	499		1,449	1,121	− 22.6		0.02	0.01	3,452	0.01
Hungary	288	5,021	5,145	789	13,756	14,096	+ 2.5	0.01	0.19	0.19	34,062	0.07
Italy	101	75	85	277	205	233	+ 13.7	0.01			3,301	0.01
Netherlands		54	435		148	1,192	+705.4			0.01	489	
Poland	3,763	772	793	10,310	2,115	2,165	+ 2.4	0.19	0.03	0.03	277,576	0.53
Roumania	48,487	34,572	31,464	132,841	94,526	86,233	− 8.8	2.44	1.33	1.14	1,129,994	2.17
U. S. S. R. (Excluding Sakhalin)	204,956	142,815	159,953	561,523	391,274	438,227	+ 12.0	10.31	5.73	6.05	5,662,536	10.91
Other Europe	9	10	10	25	27	27		0.00			96	
Total Europe	263,243	191,669	209,722	721,214	525,120	574,581	+ 9.4	13.24	7.39	7.62	7,253,142	13.98
AFRICA—												
Egypt	1,581	9,405	8,913	4,331	25,767	24,419	− 5.2	0.08	0.36	0.32	98,322	0.19
Algeria		5	1		14	3	− 78.6				149	
Other Africa	27	23	20	74	63	55	− 12.7	0.00			263	
Total Africa	1,608	9,433	8,934	4,405	25,844	24,477	− 5.3	0.08	0.36	0.32	98,734	0.19
ASIA, MIDDLE EAST—												
Bahrein	8,298	7,309	8,010	22,734	20,025	21,945	+ 9.6	0.42	0.28	0.29	78,589	0.15
Iran (Persia)	78,372	127,407	144,896	214,718	349,060	396,975	+ 13.7	3.94	4.91	5.27	1,588,242	3.06
Iraq	32,643	32,349	32,777	89,433	88,628	89,800	+ 1.3	1.64	1.25	1.19	343,636	0.66
Kuwait			5,990			16,411				0.22	5,990	0.01
Saudi Arabia	495	21,311	60,341	1,356	58,386	165,318	+183.1	0.03	0.82	2.19	112,743	0.22
Total Middle East	119,808	188,376	252,014	328,241	516,099	690,449	+ 33.8	6.03	7.26	9.16	2,129,200	4.10
ASIA, FAR EAST—												
British Indies	6,913	3,000	3,500	18,940	8,219	9,589	+ 16.7	0.35	0.12	0.13	128,032	0.25
India	2,488	2,195	2,165	6,816	6,014	5,932	− 1.4	0.12	0.08	0.08	331,302	0.64
Burma	7,538	750	750	20,652	2,054	2,054		0.38	0.03	0.03		
China		500	512		1,370	1,403	+ 2.4		0.02	0.02	2,406	
Japan (including Taiwan)	2,511	1,000	1,425	6,879	2,740	3,904	+ 42.5	0.13	0.04	0.05	97,434	0.19
Netherlands Indies	57,318	20,000	10,121	157,036	54,795	27,729	− 49.4	2.88	0.77	0.37	1,129,512	2.17
Sakhalin (U. S. S. R.)	3,821	5,135	6,135	10,469	16,808	16,808		0.19	0.24	0.22	66,510	0.13
Total Far East	80,589	33,580	24,608	220,792	92,000	67,419	− 26.7	4.05	1.30	0.90	1,755,196	3.38
Total Asia	200,397	221,956	276,622	549,033	608,099	757,868	+ 24.6	10.08	8.56	10.06	3,884,396	7.48
AUSTRALIA-NEW ZEALAND	4	5	5	11	14	14					50	
World, Undistributed	4	15	15	11	41	41					1,132	
Total World	1,988,041	2,593,263	2,751,401	5,446,088	7,104,830	7,538,085	+ 6.1	100.00	100.00	100.00	51,891,881	100.00

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WORLD CRUDE PRODUCTION—Continued

barrels, or a daily average of 16,411 barrels for the year. Production at the end of 1946 was 45,000 barrels daily with an upward trend evident.

Yearly production in Saudi Arabia almost almost tripled during 1946 as compared with 1945. The output was 60,341,000 barrels as against 21,311,000 barrels the previous year, an average of 165,318 barrels daily against 58,386 barrels daily in 1945, or almost 184 percent. Production in Iran was up 13.7 percent while the output in Iraq and Bahrein Island also was boosted.

The Middle East area is scheduled to produce another record volume in 1947. Daily average production of these countries at the beginning of the year was roughly 754,000 barrels, 50,000 barrels more than their average for 1946, a rate which should be maintained and even increased in 1947.

An increase of great magnitude is scheduled for Middle East crude output, but it will be impossible for any of the projected new facilities to be completed during 1947. Enlarged output from the Middle East countries during both 1947 and 1948 will depend entirely upon the use of additional tankers than heretofore. Outside of the line now under construction from Iraq's Kirkuk field, none of the other transportation systems planned for the Middle East can be in operation before 1951.

South America's oil flow in 1946 was up 14.4 percent, all of the gain being accounted for by the growing output in Venezuela. Production in Venezuela rose 64,330,000 barrels in the year, an increase of 176,246 barrels daily, or almost 20 percent. Output in all other Latin American countries registered decreases; however, in some instances this will be remedied during 1947. With Venezuela's output remaining at an all-time peak, the production for South America is expected to show an increase during this year.

In Europe, all countries showed increased production except Albania, Great Britain and Roumania. This was due to the fast reconstruction of the fields in order to meet normal demands and to relieve the Allied Nations from drawing so heavily from their own sources.

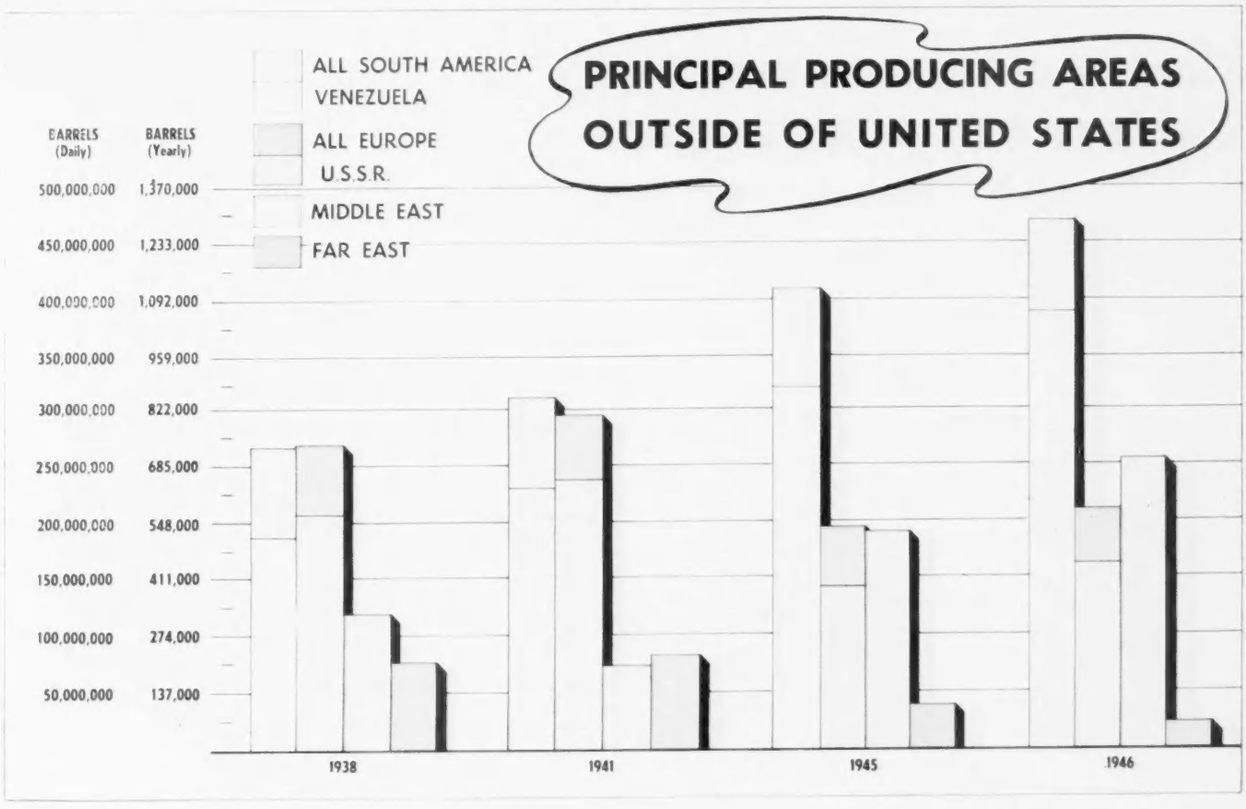
Russia's production, still an item for speculation outside of Moscow, was estimated at 159,953,000 barrels during 1946. This was an increase of 12 percent over the estimated 142,815,000 barrels produced in 1945. The latter figure was revised downward sharply from first 1945 estimates, as more information became available. It is possible that Russia's estimated production during the whole war period eventually will be revised downward.

Production in France rose more than 100 percent during the year. Most of this oil comes from the Pechelbronn field. Output in Austria, Germany, Hungary, Italy and Poland was also boosted. The Netherlands' one field produced 435,000 barrels during 1946 as compared with about 54,000 barrels in 1945.

Egypt accounts for almost all of the crude oil flow in Africa but there the production was down 5.2 percent. Egypt's output was 8,913,000 barrels in 1946 as compared with 9,405,000 barrels in 1945. However, a new discovery made during the first part of 1947 is likely to give the country a sharp boost in output during 1947.

In the Far East, including the East Indies, oil field work was hampered by continued fighting in some areas during 1946 and the estimated output for this area was down considerably. The only gains registered were in China, Japan and British East Indies.

World cumulative production on January 1, 1947, was 51,891,881,000 barrels of which the United States has produced 33,223,335,000 barrels, or 64.01 percent.



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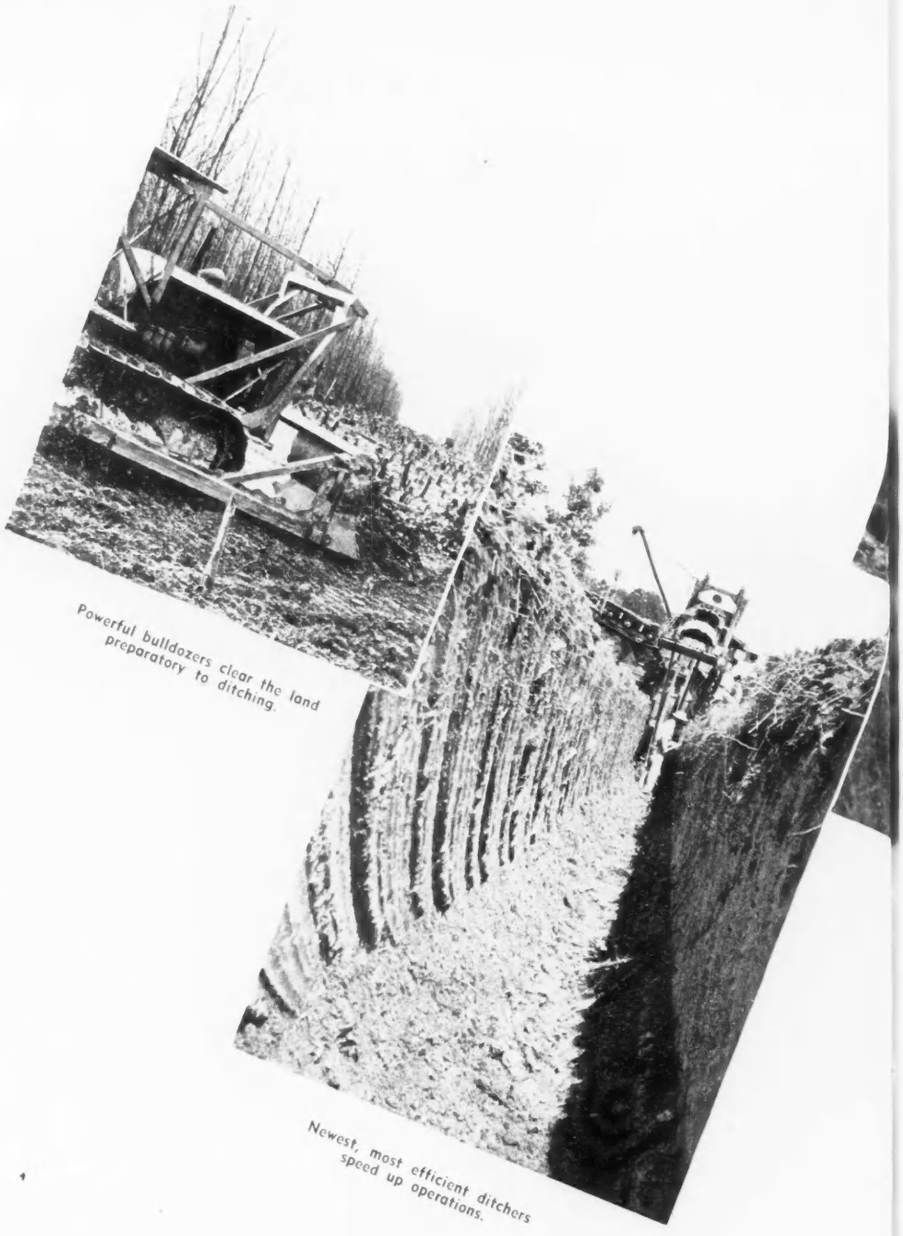

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WORLD CRUDE PRODUCTION

(Complete production history of world, in thousands of barrels of 42 U. S. Gallons. *Sources: Mineral Resources and Minerals Yearbook*, except as otherwise indicated)

YEAR	World Total	Percent Produced by U.S.	NORTH AMERICA					SOUTH AMERICA									
			Canada	Mexico	United States	Other North America	Total North America	Argentina	Bolivia	Brazil	Chile	Colombia	Ecuador	Peru	Trinidad	Venezuela	Total South America
1857	2																
1858	4																
1859	6	31			2		2										
1860	509	98			500		500										
1861	2,131	99			2,114		2,114										
1862	3,092	99	12		3,057		3,069										
1863	2,763	94	83		2,611		2,694										
1864	2,304	92	90		2,116		2,206										
1865	2,716	92	110		2,498		2,608										
1866	3,899	92	175		3,598		3,773										
1867	3,709	90	190		3,347		3,537										
1868	3,990	91	200		3,646		3,846										
1869	4,696	90	220		4,215		4,435										
1870	5,799	91	250		5,261		5,511										
1871	5,730	91	270		5,205		5,475										
1872	6,877	92	308		6,293		6,601										
1873	10,838	91	365		9,896		10,259										
1874	11,933	92	169		10,927		11,096										
1875	9,977	88	220		8,788		9,008										
1876	11,051	83	312		9,133		9,445										
1877	15,754	85	312		13,350		13,662										
1878	18,417	84	312		15,397		15,709										
1879	23,601	84	575		19,914		20,489										
1880	30,018	88	350		26,286		26,636										
1881	31,993	86	275		27,661		27,936										
1882	35,704	85	275		30,350		30,625										
1883	30,255	78	250		23,450		23,700										
1884	35,969	67	250		24,218		24,468										
1885	36,765	59	250		21,859		22,109										
1886	47,243	59	584		28,065		28,649										
1887	47,807	59	526		28,283		28,809										
1888	52,165	53	695		27,612		28,307										
1889	61,507	57	705		35,164		35,869										
1890	76,633	60	795		45,824		46,619										
1891	91,100	60	755		54,293		55,048										
1892	88,739	57	780		50,515		51,295										
1893	92,438	53	798		48,431		49,229										
1894	89,337	55	829		49,344		50,173										
1895	103,692	51	726		52,892		53,618										
1896	114,199	53	727		60,960		61,687							47			47
1897	121,993	50	710		60,476		61,186							71			71
1898	124,979	44	758		55,364		56,122							71			71
1899	131,147	44	808		57,071		57,879							89			89
1900	149,137	43	913		63,621		64,534							274			274
1901	167,440	41	757	10	69,389		70,156							275			275
1902	181,809	49	531	40	88,767		89,338							287			287
1903	194,879	52	487	75	100,461		101,023							278			278
1904	217,948	54	553	126	117,081		117,760							290			290
1905	215,091	63	634	251	134,717		135,602							373			373
1906	213,263	59	569	502	126,494		127,565							531			531
1907	263,957	63	789	1,005	166,095		167,889	*						751			751
1908	285,287	63	528	3,933	178,527		182,988	12						945	*		957
1909	298,709	61	421	2,714	183,171		186,306	18						1,411	57		1,486
1910	327,763	64	316	3,634	209,557		213,507	20						1,258	143		1,421
1911	344,361	64	291	12,553	220,449		233,293	13						1,465	285		1,763
1912	352,443	63	243	16,558	222,935		239,736	47						1,752	437		2,236
1913	385,345	64	228	25,696	248,446		274,370	131						2,071	504		2,706
1914	407,544	65	215	26,235	265,763		292,213	276						1,837	644		2,757
1915	432,033	65	215	32,911	281,104		314,230	513						2,579	750		3,842
1916	457,500	66	198	40,546	300,767		341,511	867						2,593	929		4,388
1917	502,891	67	214	55,293	335,316		390,823	1,218					57	2,577	1,692	12	5,574
1918	503,515	71	305	63,828	355,928		420,061	1,353					†60	2,527	2,082	333	6,355
1919	555,875	68	241	87,073	378,367		465,681	1,331					†60	2,628	1,841	425	6,285
1920	688,884	64	196	157,069	442,929		600,194	1,651					†60	2,817	2,083	457	7,068
1921	766,002	62	188	193,398	472,183		665,769	2,036				67	†60	3,699	2,354	1,433	9,649
1922	858,898	65	179	182,278	557,531		739,988	2,866				323	†60	5,314	2,445	2,201	13,209
1923	1,015,736	72	170	149,585	732,407		882,162	3,400				425	87	5,699	3,051	4,201	16,863
1924	1,014,318	70	161	139,678	713,940		853,779	4,639				445	†100	8,379	4,057	9,042	26,662
1925	1,068,933	71	332	115,515	763,742		879,590	6,336				1,007	160	9,232	4,387	19,687	40,809
1926	1,096,823	70	364	90,421	770,874		861,659	7,851				6,444	214	10,762	4,971	36,911	67,153
1927	1,262,582	71	477	64,121	901,129		965,727	8,630				15,014	537	10,127	5,387	63,134	102,822
1928	1,324,774	68	624	50,151	901,474		952,249	9,070				19,897	1,084	12,006	7,684	105,749	155,490
1929	1,485,867	68	1,117	44,688	1,007,323		1,053,128	9,391	*			20,385	1,381	13,422	8,716	137,472	190,767
1930	1,410,037	64	1,522	39,530	898,011		939,063	9,002	56			20,346	1,553	12,449	9,419	136,669	189,494
1931	1,372,532	62	1,543	33,039	851,081		885,663	11,709	25			18,237	1,762	10,089	9,744	116,613	168,179
1932	1,309,677	60	1,044	32,805	785,159		819,008	13,139	44			16,414	1,597	9,899	10,126	116,541	167,760
1933	1,442,146	63	1,145	34,001	905,656	23	940,825	13,691	112			13,158	1,620	13,257	9,561	117,72	169,119
1934	1,522,281	60	1,417	38,172	908,067	28	947,682	14,024	159			17,341	1,637	16,314	10,894	136,103	196,472
1935	1,654,488	60	1,447	40,241	996,596	47	1,038,331	14,297	164			17,598	1,732	17,067	11,671	148,254	210,783
1936	1,791,540	61	1,500	41,028	1,099,687	62	1,142,277	15,458	105			18,756	1,942	17,593	13,237	154,794	221,885
1937	2,039,231	63	2,944	46,907	1,279,16	33	1,329,044	16,355	122			20,599	2,161	17,457	15,503	186,23	258,427
1938	1,988,041	61	6,966	38,506	1,214,355	78	1,259,905	17,076	226			21,582	2,246	15,839	17,737	188,174	262,880
1939	2,086,160	60.6	7,838	42,898	1,264,962	112	1,315,810	18,613	215			23,857	2,313	13,508	19,270	236,470	284,246
1940	2,149,821	62.9	8,591	44,036	1,353,214	142	1,405,983	20,609	288	2		25,593	2,349	12,126	22,227	185,570	268,764
1941	2,222,941	63.1	10,134	42,196	1,402,228	150	1,454,708	21,873	235	3		24,553	1,557	11,935	20,506	228,430	309,092
1942	2,079,866	66.7	10,365	34,815	1,386,645	150	1,431,975	23,704	308	31		10,487	2,278	13,629	22,069	147,675	220,181
1943	2,231,423	67.5	10,052	35,163	1,505,613	150	1,550,978	27,714	334	80		13,261	2,378	14,654	21,385	177,631	257,437
1944	2,614,345	64.2	10,099	38,203	1,677,904	150	1,726,356	24,230	314	80		22,291	2,892	14,380	22,139	257,046	343,378
1945	2,593,263	69.0	8,538	43,547	1,711,103	172	1,763,360	22,881	406	79		22,802	2,664	13,744	21,093	323,156	406,825
1946	2,751,401	63.0	7,565	49,235	1,733,424	268	1,790,492	20,594	346	67		22,062	2,367	12,456	20,233	387,486	465,611
Total	51,801,881	64.0	121,185	2,234,209	33,223,335	1,565	35,580,294	366,638	3,459	342		392,944	38,968	344,839	331,216	3,595,727	5,074,133

* Less than 1,000 barrels. † Approximate production.

WORLD CRUDE PRODUCTION—Continued

(Complete production history of world, in thousands of barrels of 42 U. S. Gallons. *Sources: Mineral Resources and Minerals Yearbook*, except as otherwise indicated)

	EUROPE														AFRICA			
YEAR	Albania	Austria	Czecho-slovakia	Great Britian	France	Ger-many	Hun-gary	Italy	Nether-lands	Poland	Rou-mania	‡U.S.S.R. (Russia)	Other Europe	‡Total Europe	Egypt	Algeria	Other Africa	Total Africa
1857											2			2				
1858											4			4				
1859											4			4				
1860											9			9				
1861								*			17			17				
1862								*			23			23				
1863								*			28	41		69				
1864								*			33	65		98				
1865								2			39	67		108				
1866								1			42	83		126				
1867								1			51	120		172				
1868								*			56	88		144				
1869								*			59	202		261				
1870								*			84	204		288				
1871								*			90	165		255				
1872								*			91	185		276				
1873								*			104	475		579				
1874								1		150	103	583		837				
1875								1		158	108	697		964				
1876								3		164	111	1,321		1,599				
1877								3		170	108	1,801		2,082				
1878								4		176	109	2,401		2,690				
1879								3		215	110	2,761		3,089				
1880						9		2		229	115	3,001		3,356				
1881						29		1		287	122	3,601		4,040				
1882						58		2		330	136	4,538		5,064				
1883						27		2		365	139	6,002		6,535				
1884						46		3		408	211	10,805		11,473				
1885						41		2		465	193	13,925		14,626				
1886						74		2		306	168	18,006		18,556				
1887						74		1		344	182	18,368		18,969				
1888						85		1		467	219	23,049		23,821				
1889						68		1		515	298	24,609		25,491				
1890						108		3		659	383	28,691		29,844				
1891						109		8		631	488	34,573		35,809				
1892						101		18		646	593	35,775		37,133				
1893						100		19		693	535	40,457		41,804				
1894						123		21		949	508	36,375		37,976				
1895						121		26		1,453	576	46,140		48,316				
1896						145		18		2,444	543	47,221		51,371				
1897						166		14		2,226	571	54,399		57,376				
1898						184		15		2,376	776	61,610		64,961				
1899						192		16		2,314	1,426	65,955		69,903				
1900						358		12		2,347	1,629	75,783		80,126				
1901						314		16		3,251	1,678	85,168		90,427				
1902						354		19		4,142	2,060	80,540		87,115				
1903						446		18		5,235	2,703	75,591		84,053				
1904						637		26		5,947	3,599	78,537		88,746				
1905						561		44		5,766	4,421	54,960		65,752				
1906						579		54		5,468	6,378	58,897		71,376				
1907						737		69		8,456	8,118	61,851		79,242				
1908						1,009		51		12,612	8,252	62,187		84,111				
1909						1,019		42		14,933	9,327	65,970		91,291				
1910						1,032		51		12,673	9,724	70,337		93,817				
1911						1,017		75		10,519	11,108	66,184		88,903	21			21
1912						1,031		54		8,535	12,976	68,019		90,615	214			214
1913						857		47		7,818	13,555	62,834		85,111	98			98
1914						781		40		6,436	12,827	67,223		87,104	753	1		754
1915						703		44		5,352	12,030	68,548		86,077	212	4		216
1916						656		51		6,587	8,945	65,817		82,056	404	8		412
1917					§	642		41		6,228	3,721	63,172		73,704	943	9		952
1918					363	270		35		6,032	8,730	27,168		42,598	1,935	7		1,942
1919			48	2	334	265		35		6,096	6,618	31,752		45,150	1,517	5		1,522
1920			69	3	356	246		35		5,607	7,435	25,430		39,181	1,042	4		1,046
1921			94	3	389	274		32		5,167	8,368	28,968		43,295	1,255	3		1,258
1922			120	1	496	319		31		5,227	9,843	35,692		51,729	1,188	9		1,197
1923			74	1	494	346		34		5,402	10,867	39,147		56,365	1,054	9		1,063
1924			76	2	497	406		39		5,657	13,369	45,355		65,401	1,122	11		1,133
1925			158	3	459	541		61		5,960	16,650	52,448		76,280	1,226	12		1,238
1926			150	2	478	653		41		5,844	23,314	64,311		94,793	1,188	9		1,197
1927			112	2	504	663		47		5,342	26,368	77,018		110,056	1,267	8		1,275
1928			94	1	512	630		46		5,492	37,773	†84,745		122,293	1,842	8		1,850
1929			93		535	704		45		4,988	34,758	†99,577		140,630	1,868	20		1,888
1930			157	*	523	1,182		59		4,904	41,624	†125,555		174,004	1,996	16		2,012
1931			134	★	520	1,606		124		4,662	49,127	162,842		219,015	2,038	★		2,038
1932			126	★	530	1,668		208		4,116	53,815	154,367		214,770	1,895	★		1,895
1933	11		122	★	562	1,665		204		4,072	54,020	154,840		215,496	1,663	★		1,663
1934	10		178	★	557	2,187		151		3,913	62,063	174,318		243,377	1,546	★		1,546
1935	41	44	133	★	541	2,996		119		3,812	61,310	182,386	2	251,384	1,301	★	4	1,305
1936	273	50	127	★	503	3,115		123		3,789	63,659	186,266	1	257,846	1,278	★	4	1,282
1937	619	221	123	★	502	3,176	16	110		3,716	52,452	193,241	4	254,180	1,196	★	22	1,218
1938	752	383	130	★	513	3,861	288	101		3,763	48,487	214,956	9	263,243	1,581	★	27	1,608
1939	934	1,240	129		500	4,487	1,103	91		3,898	45,648	216,866	10	274,897	4,666	★	27	4,693
1940	1,497	2,808	163	124	496	7,371	1,881	85		3,891	43,168	218,600	10	280,094	6,505	★	27	6,532
1941	1,381	4,263	183	223	414	6,313	3,178	95		3,319	40,517	238,150	10	298,046	8,546	★	27	8,573
1942	1,450	5,920	271	605	463	5,208	5,013	101		3,400	42,094	227,470	10	292,005	8,275	★	27	8,302
1943	715	7,800	200	839	500	6,500	6,313	75		3,500	39,182	200,750	10	266,384	8,953	★	25	8,978
1944	765	9,760	185	703	500	7,600	6,104	75		3,000	26,191	275,000	10	329,893	9,416	★	30	9,446
1945	750	3,069	188	529	113	3,771	5,021	75	54	772	34,502	142,815	10	191,669	9,405	5	23	9,433
1946	725	5,636	203	409	233	4,634	5,145	85	435	790	31,464	159,953	10	209,722	8,913	1	20	8,934
Tota	9,923	41,194	3,831	3,452	13,387	87,210	34,062	3,301	489	277,576	1,129,094	5,649,527	96	7,253,142	98,322	149	263	98,734

‡ Includes fields in Russian Asia other than Sakhalin. * Less than 1000 barrels. ★ No more data available. § France's earlier production credited to Germany. †Year ended September 30.

WORLD CRUDE PRODUCTION—Continued

(Complete production history of world, in thousands of barrels of 42 U. S. Gallons. *Sources: Mineral Resources and Minerals Yearbook*, except as otherwise indicated)

	ASIA—Middle East						ASIA—Far East										
YEAR	Bahrein	Iran	Iraq	Kuwait	Saudi Arabia	Total Middle East	British Borneo	‡India	‡Burma	China	Japan	Netherland India	Sakhalin	Total Far East	*Total Asia	Australia-New Zealand	Rest of World
1857																	
1858																	
1859																	
1860																	
1861																	
1862																	
1863																	
1864																	
1865																	
1866																	
1867																	
1868																	
1869																	
1870																	
1871																	
1872																	
1873																	
1874																	
1875											5			5	5		
1876											7			7	7		
1877											10			10	10		
1878											18			18	18		
1879											23			23	23		
1880											26			26	26		
1881											17			17	17		
1882											15			15	15		
1883											20			20	20		
1884											28			28	28		
1885											30			30	30		
1886											38			38	38		
1887											29			29	29		
1888											37			37	37		
1889									94		53			147	147		
1890									118		52			170	170		
1891									190		53			243	243		
1892									242		69			311	311		
1893									299		106	600		1,005	1,005		
1894									327		173	688		1,188	1,188		
1895									372		170	1,216		1,758	1,758		
1896									430		237	1,427		2,094	2,094		
1897									546		262	2,552		3,360	3,360		
1898									542		319	2,964		3,825	3,825		
1899									941		539	1,796		3,276	3,276		
1900									1,079		871	2,253		4,203	4,203		
1901									1,431		1,117	4,014		6,562	6,562		20
1902									1,617		996	2,430		5,043	5,043		26
1903									2,510		1,209	5,770		9,489	9,489		36
1904									3,385		1,219	6,508		11,112	11,112		40
1905									4,137		1,347	7,850		13,334	13,334		30
1906									4,016		1,564	8,181		13,761	13,761		30
1907									4,344		1,718	9,983		16,045	16,045		30
1908									5,047		1,871	10,283		17,201	17,201		30
1909									6,677		1,887	11,042		19,606	19,606		20
1910									6,138		1,829	11,031		18,998	18,998		20
1911									6,451		1,737	12,173		20,361	20,361		20
1912									7,117		1,659	10,846		19,622	19,622		20
1913		1,857				1,857	141		7,930		1,940	11,172		21,183	23,040		20
1914		2,910				2,910	318		7,410		2,036	11,422		21,786	24,696		20
1915		3,616				3,616	392		8,202		2,928	11,921		23,442	27,058		10
1916		4,477				4,477	629		8,491		2,963	12,547		24,630	29,107		25
1917		7,147				7,147	542		8,079		2,861	13,180		24,862	31,899		29
1918		8,623				8,623	594		8,188		2,441	12,778		23,911	32,534		25
1919		10,139				10,139	596		8,736		2,238	15,508		27,078	37,217		20
1920		12,230				12,230	1,020		8,375		2,221	17,529		29,145	41,375		20
1921		16,673				16,673	1,411		8,734		2,233	16,958	2	29,338	46,011		20
1922		22,247				22,247	2,849		8,529		2,055	17,066	7	30,506	52,753		22
1923		25,230				25,230	3,040		8,466		1,804	19,870	9	34,029	59,259		24
1924		32,373				32,373	4,163		8,416		1,814	20,473	80	34,946	67,319		24
1925		35,038				35,038	4,257		8,274		1,915	21,422	87	35,955	70,993		23
1926		35,842				35,842	4,942		8,011		1,785	21,243	181	36,162	72,004		17
1927		39,688	338			40,026	4,943		8,032		1,789	27,459	440	42,663	82,689		13
1928		43,461	713			44,174	§5,223		8,741		1,944	32,118	677	48,703	92,877		15
1929		42,145	798			42,943	5,290		8,747		2,023	39,279	21,134	56,473	99,416		38
1930		45,828	913			46,741	4,907		8,292		1,950	41,729	21,805	58,683	105,424		40
1931		44,376	830			45,206	3,854		8,200		2,050	35,539	2,734	52,377	97,583		54
1932		49,471	836			50,307	3,796		8,817		1,630	39,001	2,631	55,875	106,182		62
1933	31	54,392	917			55,340	4,490		8,743		1,455	42,606	2,338	59,632	114,972		71
1934	285	57,851	7,689			65,825	5,140		10,503		1,834	46,925	2,881	67,283	133,108		96
1935	1,265	57,273	27,408			85,946	5,546	2,038	7,181		2,249	47,171	2,545	66,730	152,676	5	4
1936	4,645	62,718	30,406		29	97,780	5,239	1,978	7,588		2,440	50,025	3,212	70,452	168,241	5	4
1937	7,762	77,804	31,836		65	117,467	6,009	2,162	7,848		2,488	56,724	3,656	78,887	196,354	4	4
1938	8,298	78,372	32,643		495	119,808	6,913	2,488	7,538		2,511	57,318	†3,821	80,589	200,397	4	4
1939	7,589	78,151	30,791		3,934	120,465	7,097	2,327	7,573	4	2,654	62,087	4,000	86,042	206,507	3	4
1940	7,074	66,317	24,225		5,075	102,691	7,047	2,302	7,731	10	2,639	62,011	4,000	85,740	188,431	3	14
1941	6,794	50,777	12,650		4,310	74,531	6,864	2,899	7,762	86	2,659	53,704	4,000	77,974	152,505	3	14
1942	6,241	72,256	19,726		4,530	102,753	3,000	2,792	2,500	340	3,000	9,000	4,000	24,632	127,385	3	15
1943	6,572	74,612	24,848		4,868	110,900	4,500	2,279	1,000	447	3,500	20,000	5,000	36,726	147,626	5	15
1944	6,714	102,045	30,943		7,794	147,496	6,000	2,500	750	507	3,000	40,000	5,000	57,757	205,253	5	14
1945	7,309	127,407	32,349		21,311	188,376	3,000	2,195	750	500	1,000	20,000	6,135	33,580	221,956	5	15
1946	8,010	144,896	32,777	5,990	60,341	252,014	3,500	2,165	750	512	1,425	10,121	6,135	24,608	276,622	5	15
Total	78,589	1,588,242	343,636	5,990	112,743	2,129,200	128,032	331,302		2,406	97,434	1,129,512	66,510	1,755,196	3,884,396	50	1,132

‡ Separation of British India and Burma prior to 1935 not available from U. S. Bureau of Mines data here used. Data by L. Dudley Stamp in "Petroleum Development and Technology, 1933," and in A.I.M.E. "Transactions" indicate cumulatives through 1934 as follows: Burma 184,528, India 20,756. * Exclusive of U.S.S.R. fields in Asia, other than Sakhalin, which are included with U.S.S.R. in Europe. † Year ended September 30. † Approximate production. § Beginning of production in Brunei.

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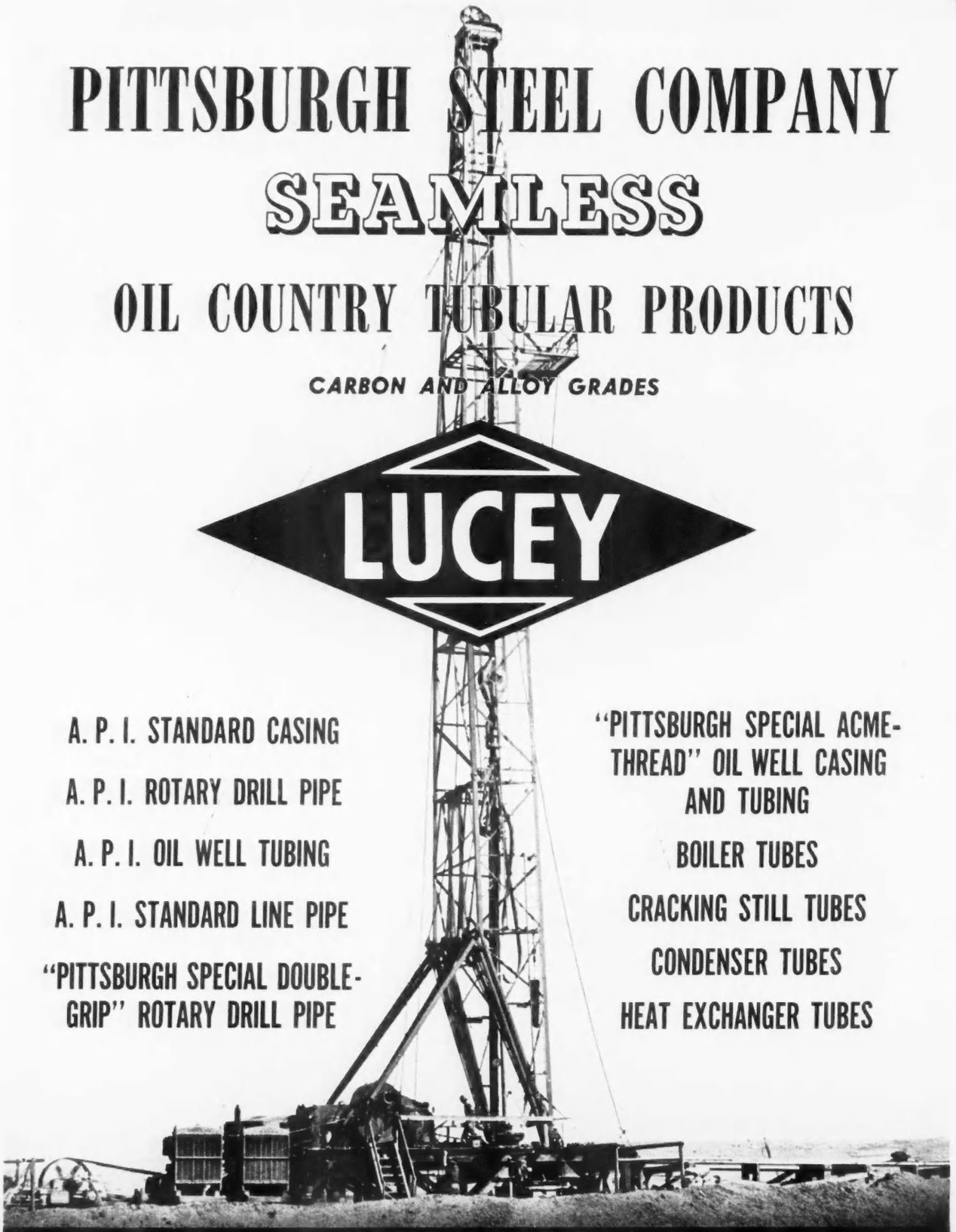

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WORLD CRUDE RESERVES

THE world's crude oil reserves on January 1, 1947, are estimated at 67,035,460,000 barrels, 24 times greater than 1946 production rate.

During 1946, crude oil production is estimated at 2,751,401,000 barrels, or 4.10 percent of the estimated reserves as of January 1, 1947.

With operations of the oil industry more nearly back to normal for the first time since the war, world oil reserves are expected to climb in 1947 even in face of a predicted heavy production rate. World oil operations are expected to reach new peaks during 1947 in almost every phase of the industry with the most serious obstacle being a possible shortage of tubular goods.

Reserves of U. S.

Slightly more than 31 percent of the estimated proved reserves on January 1, 1947, are located in the United States where production in 1946 was 63 percent of the world output. United States crude reserves are estimated at 20,873,560,000 barrels and during 1946 the output was 1,733,424,000 barrels, or 8.3 percent of the estimated proved reserves at the end of the year. Thus, with about one-third of the estimated proved reserves, the United States, during 1946, accounted for approximately two-thirds of the world crude oil production.

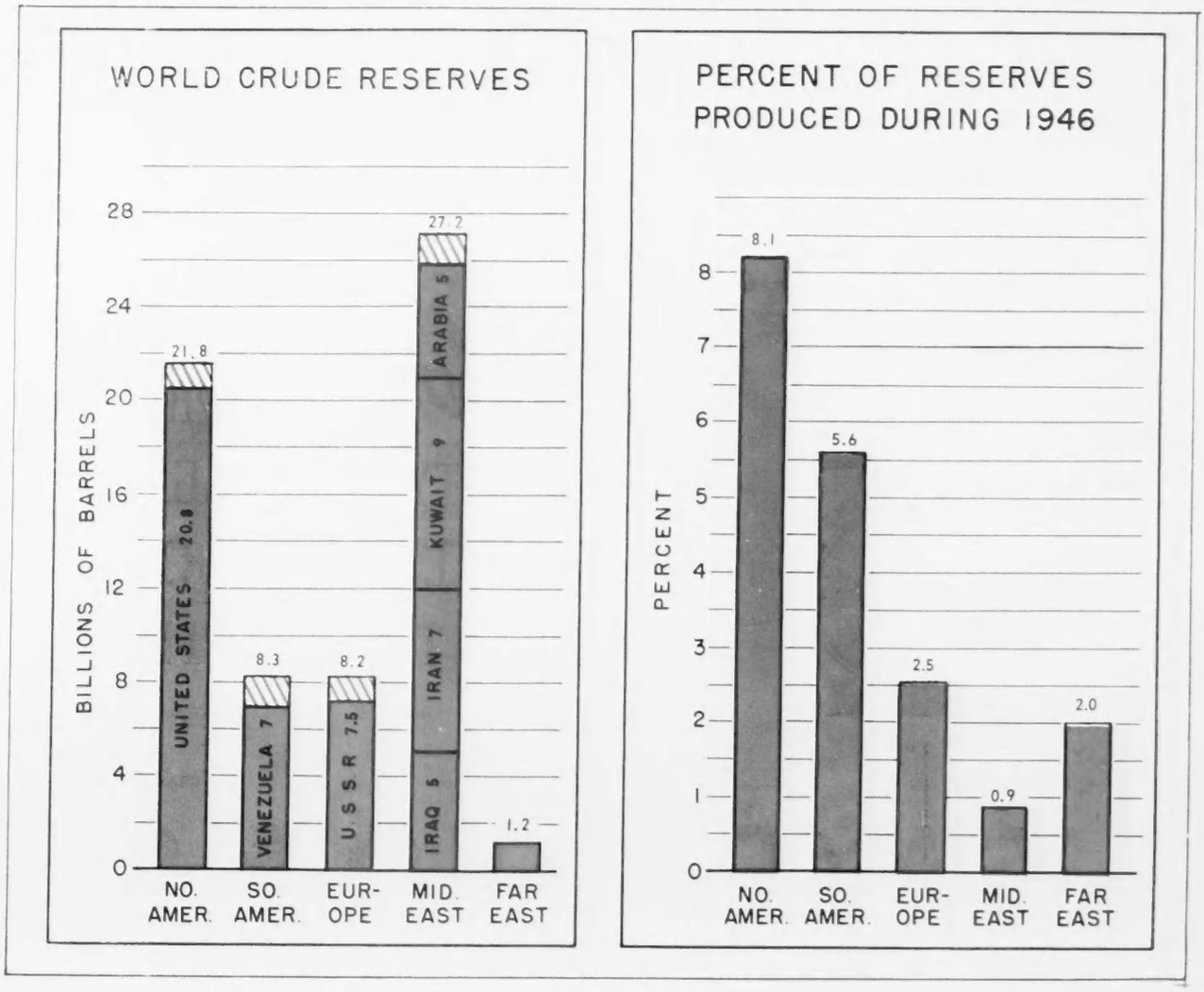
The country with the second largest estimated proved reserves is Kuwait, in the Middle East. Kuwait's reserves are estimated at 9 billion barrels, or 13.43 percent of the world estimate. However, crude oil production in Kuwait did not begin until the middle of 1946 and during the remainder of the year the output totaled 5,990,000 barrels, or .22 percent of the world flow. The production also represented only .07 percent of Kuwait's estimated reserves. Kuwait's production in 1947 is expected to triple the 1946 output.

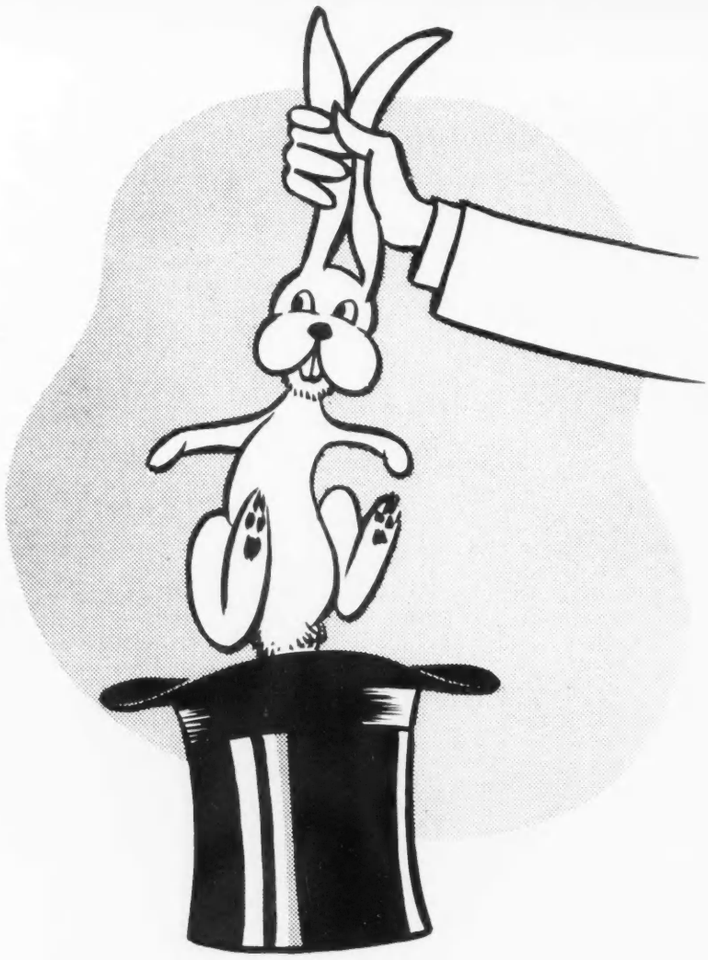
Middle East Largest

Almost 75 percent of the estimated proved reserves at the end of 1946 were located in two world areas—North America and the Middle East. The latter accounted for 40.69 percent of the reserves and North America had 32.63 percent. Middle East reserves were estimated at 27,275,000,000 barrels and during 1946 the output of this area was 252,014,000 barrels, or 9.16 percent of the world production. The output also was only .92 percent of the area's estimated proved reserves.

With Kuwait the site of the largest reserves in the Middle East, the second largest reserves are located in Iran. There the reserves are estimated at 7 billion barrels, or 10.44 percent of the world estimated. During 1946, Iran produced 144,896,000 barrels of oil, or 5.27 percent of the world output and 2.07 percent of the country's estimated proved reserves.

Iraq and Saudi Arabia each has reserves estimated at 5





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WORLD CRUDE RESERVES—Continued

billion barrels, with each country accounting for 7.46 percent of the world total. Production in Saudi Arabia in 1946 was 60,341,000 barrels, or 2.19 percent of the world flow and represented 1.21 percent of her estimated reserves. Production in Iraq was 32,777,000 barrels in 1946, or 1.19 percent of the world flow and represented .66 percent of Iraq's estimated reserves.

Reserves of Bahrein Island are estimated at 275 million barrels, or .41 percent of the world estimated reserves. Output in 1946 was 8,010,000 barrels, or .29 percent of the world production and was 2.91 percent of the area's estimated reserves. Reserves in Qatar are estimated at 1 billion barrels, or 1.49 percent of the world total. So far, actual production of crude oil in Qatar has been delayed.

On the North American continent, Mexico's reserves are estimated at 850 million barrels, or 1.27 percent of the world total. During 1946, Mexico produced 49,235,000 barrels which was 1.79 percent of the world production and represented 5.79 percent of the country's estimated reserves. Canadian reserves are estimated at 150 million barrels, or .22 percent of the world total. Output in 1946 was 7,565,000 barrels which was .27 percent of the world flow and 5.04 percent of the nation's estimated reserves.

Venezuela Reserves

Reserves of South America and Europe are about the same, with the two areas having slightly more than 24 percent of the world's proved reserves. South America's reserves are estimated at 8,301,000,000 barrels, or 12.38 percent of the world total. Venezuela accounts for a great majority of the proved reserves of this continent. There the reserves are estimated at 7 billion barrels, or 10.44 percent of the world estimated. During 1946, Venezuela produced 387,486,000 barrels, or 14.08 percent of the world flow and represented 5.54 percent of her total reserves. Colombia's reserves are estimated at 500 million barrels, or .75 percent of the world reserves. Trinidad's reserves are estimated at 300 million barrels, or .45 percent of the world total.

Activity in South America will be greatly expanded during 1947 which in turn should increase the reserves of this area.

European reserves are estimated at 8,222,200,000 barrels, or 12.27 percent of the world total. Most of these reserves are located in the USSR where, based on the most reliable information available, the proved reserves are estimated at 7½ billion barrels, or 11.19 percent of the world estimate. Second largest European reserves are located in Roumania with an estimate of 400 million barrels. Germany's reserves are estimated at 80 million barrels and reserves of Hungary and Austria are estimated at 75 million barrels each. Total production in Europe during 1946 was 209,722,000 barrels, or 7.62 percent of the world flow and represented 2.55 percent of the area's estimated reserves.

Far East Region

Total reserves of the Far East, including the East Indies, are estimated at 1,222,000,000 barrels, or 1.82 percent of the world estimate. Netherlands Indies, with 850 million barrels, is the site of the largest reserves. Production in the Far East during 1946, hampered by the ravages of war, was estimated at 24,608,000 barrels, or less than one percent of the world output.

The second largest reserves of the Far East are situated in Burma. These reserves are estimated at 125 million barrels with production during 1946 being only about 750,000 barrels or .03 percent of the estimated reserves. In the British Indies, principally in British Borneo, the reserves are estimated at 75 million barrels with the production in 1946 estimated at 3½ million barrels.

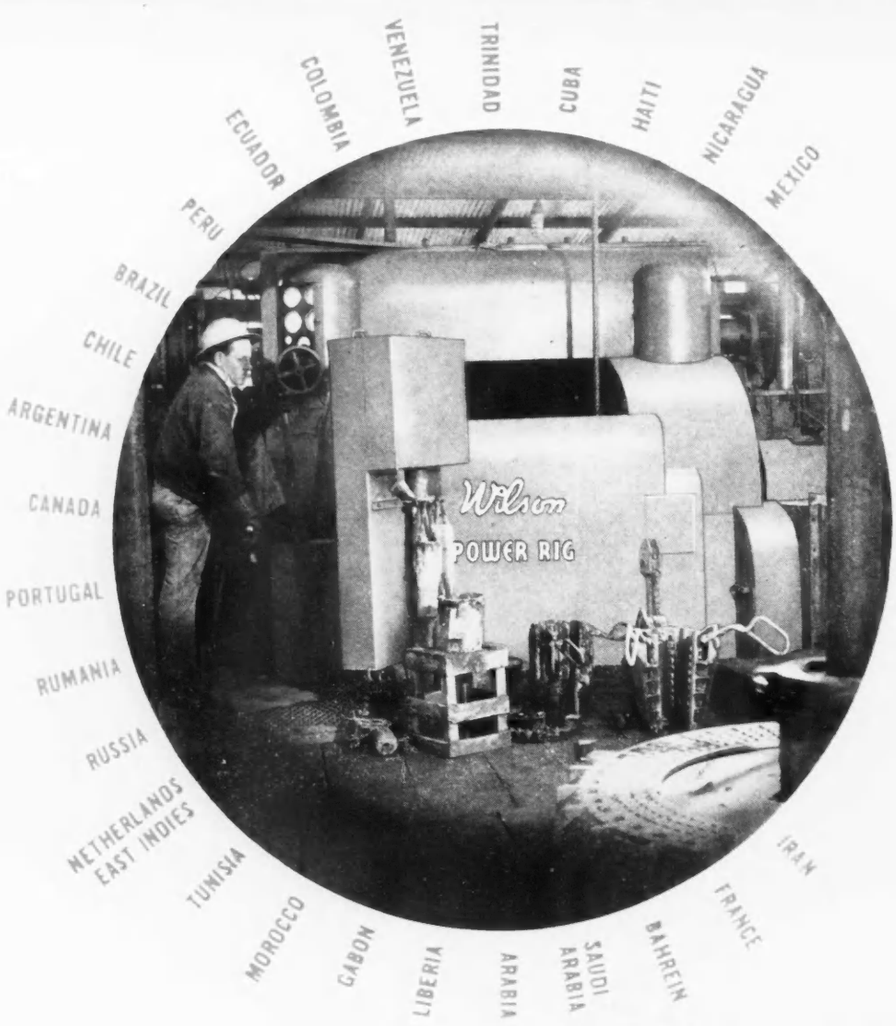
Most all of the crude oil reserves of Africa are located in Egypt. The reserves of this country are estimated at 138 million barrels. Reserves of the remainder of the world are estimated at less than one million barrels.

World's Proved Crude Oil Reserves

(THOUSANDS OF BARRELS)

CONTINENT AND COUNTRY	Estimated Proved Reserves Jan. 1, 1947	Percent of World Reserves	Crude Oil Production in 1946	Production in 1946 As Percent of World	Percent of Reserves Produced in 1946
North America:					
Canada	150,000	0.22	7,565	0.27	5.04
Cuba	3,000	0.00	268	0.01	8.93
Mexico	850,000	1.27	49,235	1.79	5.79
United States	20,873,560	31.14	1,733,424	63.00	8.30
Total North America	21,876,560	32.63	1,790,492	65.08	8.18
South America:					
Argentina	275,000	0.41	20,594	0.75	7.49
Bolivia	50,000	0.07	346	0.01	0.69
Brazil	1,000	0.00	67		6.70
Colombia	500,000	0.75	22,062	0.80	4.41
Ecuador	25,000	0.04	2,367	0.09	9.47
Peru	150,000	0.22	12,456	0.45	8.30
Trinidad	300,000	0.45	20,233	0.74	6.74
Venezuela	7,000,000	10.44	387,486	14.08	5.54
Total South America	8,301,000	12.38	465,611	16.92	5.61
Europe:					
Albania	25,000	0.04	725	0.03	2.90
Austria	75,000	0.11	5,636	0.20	7.51
Czechoslovakia	3,200	0.00	203	0.01	6.34
England	7,500	0.01	409	0.02	5.45
France	10,000	0.02	233	0.01	2.33
Germany	80,000	0.12	4,634	0.17	5.79
Hungary	75,000	0.11	5,145	0.19	6.86
Italy	1,000	0.00	85		8.50
Netherlands	25,000	0.04	435	0.02	1.74
Poland	20,000	0.03	790	0.03	3.95
Roumania	400,000	0.60	31,464	1.14	7.87
U.S.S.R. (Except Sakhalin)	7,500,000	11.19	159,953	5.81	2.13
Yugoslavia	500	0.00	10		2.00
Total Europe	8,222,200	12.27	209,722	7.62	2.55
Africa:					
Egypt	138,000	0.21	8,913	0.32	6.46
Other Africa	500	0.00	21		4.20
Total Africa	138,500	0.21	8,934	0.32	6.45
Asia, (Middle East):					
Bahrein	275,000	0.41	8,010	0.29	2.91
Iran (Persia)	7,000,000	10.44	144,896	5.27	2.07
Iraq	5,000,000	7.46	32,777	1.19	0.66
Kuwait	9,000,000	13.43	5,990	0.22	0.07
Qatar	1,000,000	1.49			
Saudi Arabia	5,000,000	7.46	60,341	2.19	1.21
Total Middle East	27,275,000	40.69	252,014	9.16	0.92
Asia (Far East):					
British Indies	75,000	0.11	3,500	0.13	4.67
Burma	125,000	0.19	750	0.03	0.60
China	15,000	0.02	512	0.02	3.41
India	35,000	0.05	2,165	0.08	6.19
Japan (incl. Taiwan)	32,000	0.05	1,425	0.05	4.45
Netherlands Indies	850,000	1.27	10,121	0.37	1.19
Sakhalin (U.S.S.R.)	90,000	0.13	6,135	0.22	6.82
Total Far East	1,222,000	1.82	24,608	0.90	2.01
Total All Asia	28,497,000	42.51	276,622	10.06	0.97
Australia-New Zealand	50	0.00	5		10.0
World, Undistributed	150	0.00	15		10.0
Total World	**67,035,460**	**100.00**	**2,751,401**	**100.00**	**4.10**

THE WORLD



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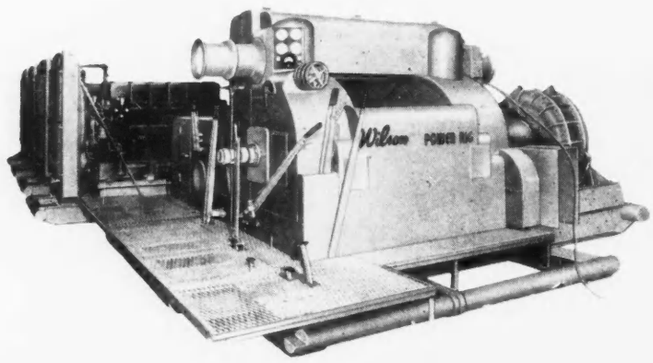

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WORLD PRODUCING WELLS

THE number of producing oil wells in the world, including flowing wells and those on artificial lift, showed a slight increase for the year ending December 31, 1946, as compared with a year ago.

Based on information available from the various oil producing countries of the world, there were 447,293 producing oil wells at the end of 1946 as compared with 442,334 producing wells in these same countries at the end of 1945. It is estimated that approximately 5 percent of the actual number of producing wells are not reported and this would give the world an estimated 470,000 producing oil wells at the end of 1946 as compared with an estimated 465,000 wells at the end of 1945.

Bulk in United States

The bulk of the oil producers are located in the United States where, at the end of 1946, there were 424,286 oil wells producing as compared with 421,433 at the end of 1945. A great percent of the wells in the United States are on artificial lift, the total being 375,899 as against 48,387 flowing wells.

Compared with the remainder of the world, the average daily output of each well producing in the United States is small. With an average daily yield of 4,724,900 barrels from all wells at the end of 1946, the net flow per well was only 11.1 barrels.

Based on available but incomplete data there are 23,007 producing wells outside the United States with a total daily yield of 2,275,129 barrels, making the net per well average 98.9 barrels daily. It is estimated that an additional 23,000 wells are producing outside of the United States.

The principal reason for the high percentage yield of wells outside of the United States is the huge production in the Middle East from such few wells. In this area there were 193 producing wells, all flowing, at the end of the year and the total output of all wells was 758,665 barrels daily. This represents a per well yield of 3930.9 barrels daily.

Highest per well yield is in Iraq where 11 wells were flowing at total of 90,000 barrels daily at the end of the year, or 8181.8 barrels daily each. Next was Iran where 67 wells were producing 406,000 barrels daily at the end of the year for a per well yield of 6059.7 barrels daily.

In Saudi Arabia, 41 wells each had a daily average production of 5236 barrels at the end of the year with the total daily output being 214,675 barrels. Kuwait's eight producing wells were flowing 27,990 barrels daily at the end of the year for a per well output of 3498.8 barrels daily.

Lowest per well output in the Middle East was on Bahrein Island. There 66 wells were producing an estimated 20,000 barrels daily at the close of 1946 for a per well flow of 303 barrels daily.

Egypt's per well production also was high, as compared with the world average. At the end of the year, Egypt had 137 wells producing 23,900 barrels daily for a per well output of 174.5 barrels daily.

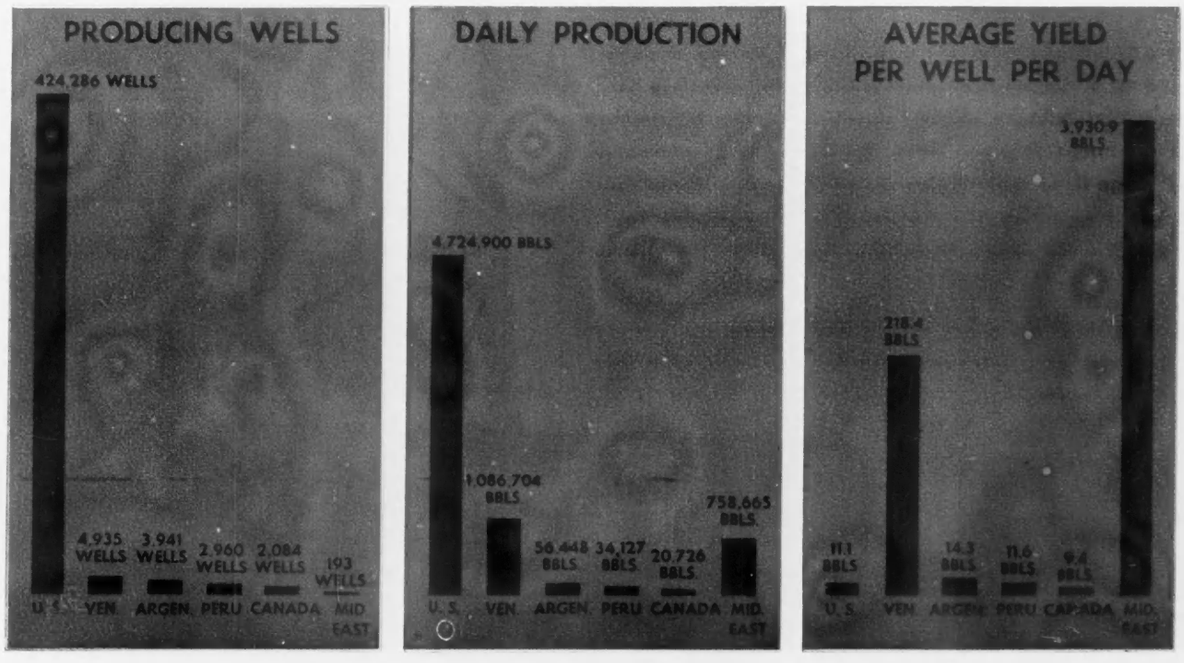
Venezuela Has Big Wells

Although Venezuela's per well output was 218.4 barrels daily, the average output of each well in South America at the end of the year was 84.6 barrels. Venezuela had 4975 wells producing at the first of the year as compared with 4699 wells a year ago. Daily average production for the country was 1,086,704 barrels and that output has increased during the first part of 1947.

Colombia's 1068 wells had a per well output of 64.3 barrels with the country's daily production being 68,693 barrels. In Trinidad, the per well output was 30.4 barrels daily from each of the 1820 producing wells.

Mexico's 953 producing wells were yielding 141.7 barrels

Producing Oil Wells and Daily Output of Principal Areas End of 1946



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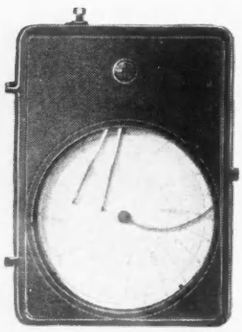

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WORLD PRODUCING WELLS—Continued

daily each at the end of the year with the total output being 135,000 barrels.

Argentina, with 3941 wells, has the second largest number of producing wells in South America. With a daily average output of 56,448 barrels from all wells during 1946, the average per well flow was 14.3 barrels daily. Peru had 2960 wells producing at the end of the year, a slight increase from the number of producers in 1945. With most of Peru's wells being on artificial lift, the average daily output per well was 11.6 barrels.

Canada had 2084 wells producing at the end of 1946, most of them being on artificial lift. This represented a slight boost from the total producing the previous year. Each well had a daily yield of 9.4 barrels, making the total daily production for the country 20,726 barrels.

Little information is available regarding the number of producing wells in each European country. However, as a whole most of the wells are on artificial lift and have a small daily yield. France had 714 wells producing at the end of 1946, all but a few being located in the Pechelbronn field, and each had a yield of less than one barrel a day.

The number of producing wells in Poland totaled 2345 at year's end, and all but nine were on artificial lift. Each well had an average output of 1.1 barrels daily. England's 242 producing wells averaged 4.3 barrels daily.

The Netherlands probably has the largest per well yield of any country in Europe. In the country's lone field there are 13 wells producing 2350 barrels daily for a net yield of 180.8 barrels daily each.

There is no estimate on the number of producing wells in Soviet Russia but based on estimated daily production the country's approximately 12,000 wells has a daily yield of about 40 barrels each.

Producing Oil Wells and Daily Production at End of Year, 1945 and 1946, by Countries

COUNTRY	Total Producing Oil Wells End of 1945	PRODUCING OIL WELLS AND THEIR OUTPUT AT END OF 1946					
		Oil Wells Shut in	Flowing	Artificial Lift	Total Producing	Daily Average Production	Barrels Daily Per Well
North America Except United States:							
Canada	1,929	737	382	1,702	2,084	20,726	9.4
Cuba	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Mexico	1,041	318	768	185	953	135,000	141.7
Total North America Outside United States	2,970	1,055	1,150	1,887	3,037	155,726	51.3
South America:							
Argentina	3,922	538	n.a.	n.a.	3,941	56,448	14.3
Bolivia	22	6	10	14	24	945	39.4
Brazil	8	17		11	11	185	16.8
Colombia	1,050	49	139	929	1,068	68,693	64.3
Ecuador	669	92	59	620	679	6,467	9.5
Peru	2,889	92	229	2,731	2,960	34,127	11.6
Trinidad	1,674	n.a.	629	1,191	1,820	55,383	30.4
Venezuela	4,699	n.a.	2,019	2,946	4,975	1,086,704	218.4
Total South America	14,933	794	3,085	8,442	15,478	1,308,952	84.6
Europe:							
Albania	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Austria	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Czechoslovakia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
England	233		1	241	242	1,047	4.3
France	616	1		714	714	640	.9
Germany	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Hungary	237	4	98	61	159	14,100	88.7
Italy	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Netherlands	20	10		13	13	2,350	180.8
Poland	1,125	261	9	2,336	2,345	2,468	1.1
Roumania	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Russia (Incl. E. Poland)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Yugoslavia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Total Europe	2,231	276	108	3,365	3,473	20,605	5.9
Africa:							
Algeria	8			12	12	91	7.6
Egypt	143	37	25	112	137	23,900	174.5
Morocco	65			80	80	40	.5
Total Africa	216	37	25	204	229	24,031	104.9
Middle East:							
Bahrein Island	62		66		66	20,000	303
Iran	59	19	67		67	406,000	6059.7
Iraq	14	95	11		11	90,000	8181.8
Kuwait			8		8	27,960	3498.8
Qatar							
Saudi Arabia	32	7	41		41	214,675	5236
Total Middle East	167	121	193		193	758,665	3930.9
Far East:							
British East Indies	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Burma	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
China	9	25		12	12	1,400	116.7
India	375	504	36	549	585	5,750	9.8
Japan	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Netherlands East Indies	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
New Zealand	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Sakhalin U.S.S.R.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Total Far East	384	529	36	561	597	7,150	12
Total Foreign	**20,901**	**2,812**	**4,597**	**14,459**	**23,007**	**2,275,129**	**98.9**
United States	**421,433**	**2,519**	**48,387**	**375,899**	**424,286**	**4,724,900**	**11.1**
Total World	**442,334**	**5,331**	**52,984**	**390,3578**	**447,293**	**7,000,029**	**15.6**

Based on available data. n.a. Indicates data not available.

An Announcement to—

ON July 7, 1947, The Oil Weekly (publisher of World Oil Atlas) changes its name to WORLD OIL.

While we share a strong attachment for the name under which the publication has made thousands of friends in the oil industry throughout the world, the step is being taken under the conviction that the new name will more fittingly cover the expanding editorial and circulation efforts of The Oil Weekly.

The idea of a change in name is not a new one. Several years ago we had it under consideration but decided to postpone action.

For more than a year we have had the matter again under advisement, and the conclusion was reached in April that the change should be made as soon as practical.

When The Oil Weekly was first founded in 1916 all editorial activities were concentrated within the confines of the United States, with special emphasis on the Southwest. As the editorial effort expanded, offices and editorial men were located in other areas, and finally worldwide operations began to command increasing attention.

There is no question that oil in the United States and oil outside the United States have the closest relationship. What happens in the United States affects oil outside of the North American continent, and what happens abroad has a direct effect on domestic oil affairs.

Oil operations abroad are growing month by month. The same thing may be said of domestic operations, but together they combine to give a WORLD OIL aspect which is most important.

In our editorial plans during the past few years we have given a great deal of attention to oil outside the United States without minimizing our extensive U. S. coverage. Whenever possible editorial material has been handled in such manner as to show the effect of international

WORLD COMPLETIONS and FOOTAGE

WORLD drilling of oil and gas wells and dry holes soared sharply during 1946 and based on rigs in operation at the close of the year, further increases will be made in 1947.

Not including countries where adequate figures are not available, completions during 1946 totaled 30,099 oil and gas wells and dry holes. This does not include input wells, disposal wells or old wells drilled deeper in the United States which totaled 2854. It is estimated that an additional 1000 completions were registered outside the United States which are unreported, thus making the world total 31,099 completions.

A majority of the completions were recorded in the United States. In fact, the percentage of drilling in the United States as compared with the rest of the world is much greater than the percentage representing volume of crude oil production.

During 1946, United States completions, not including the input wells, disposal wells or old wells drilled deeper, totaled 27,987 wells, or 92.98 percent of all the wells reported drilled during the year. This compares with 25,846 completions registered in 1945. At the end of the year there were 4644 rigs in operation in the United States while at the end of 1945 there were 4367 active rigs.

The United States also accounts for a great majority of the footage drilled during 1946. The world total footage was 105,012,005 feet or an average of 3500 feet per completion. Footage drilled in the United States amounted to 97,408,709 feet, or 92.76 percent of all the footage reported drilling during 1946. Completions in the United States included 16,169 oil wells, 3303 gas wells and 8515 dry holes.

Of the countries from which adequate information is available, Venezuela had the largest amount of drilling outside the United States. Completions during 1946 totaled 627 as compared with 531 in 1945, or an increase of 18.1 percent. The completions included 574 oil wells and 53 dry holes. Footage drilled in Venezuela during 1946 amounted to 3,379,811 feet. At the end of the year 83 rigs were in operation.

Completion of wells by private interests in Argentina last year totaled 115. Information on completions by Yacimientos Petroliferos Fiscales (Argentine government-owned company) is not available. Footage drilled by private interests in Argentina during 1946 totaled 296,050 feet.

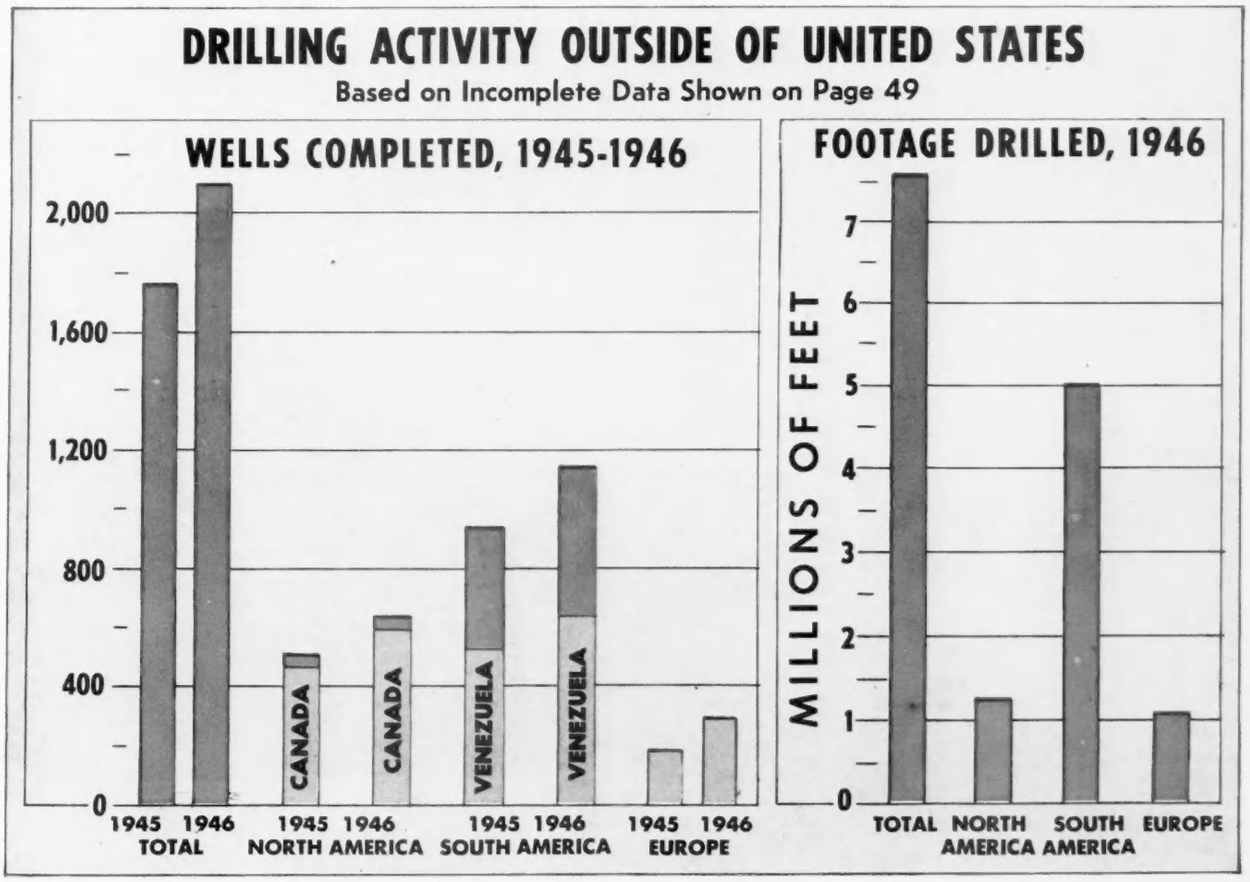
Drilling in Peru was boosted considerably during the year with completions totaling 134 as against 102 completions in 1945. Footage drilled amounted to 322,715 feet. An increase in wildcat drilling accounted for this boost. The completions included 94 oil wells, 3 gas wells and 37 dry holes. At the end of the year 50 rigs were active in Peru.

Colombia's drilling activities were increased 100 percent during 1946 as compared with 1945. Completions last year totaled 118 as against 59 during 1945. Footage drilled totaled 454,744 feet. At year's end 22 rigs were active in Colombia.

Trinidad also experienced an increase in drilling activities with 120 completions recorded last year as against only 41 during 1945. Footage drilled in Trinidad in 1946 amounted to 531,458 feet.

Drilling in Canada was also up during 1946 when 586 wells were completed for a total footage of 983,262 feet. in 1945, completions amounted to 437.

Mexico's drilling activities were down from 1945 when 53 wells were completed. In 1946, the completions totaled



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WORLD COMPLETIONS and FOOTAGE—Continued

49 of which almost half were dry holes. Footage drilled was 261,253 feet.

Very little definite information is available on drilling activities in Europe. With production in most of the countries up, it is likely that actual completions were also boosted. There is no information on Russia's drilling activities but estimates place the completions at about 800.

In the British occupied zone of Germany, the completions in 1946 amounted to 110, including 61 dry holes. Footage drilled was 261,337 feet. France experienced an increase in drilling with still further advances expected in 1947. During last year the completions totaled 53 as against only 17 in 1945. Completions in Poland totaled 87 while in 1945 the completions were 54.

Drilling in Africa was increased about 20 percent with completions totaling 39, including 16 in Egypt, 19 in Morocco and 4 in Algeria.

In anticipation of a sharp advance in crude oil production, drilling in the Middle East was up considerably with an additional boost expected in 1947. Completions in 1946 amounted to 27 while only 10 wells were completed in 1945. All of the completions in the Middle East countries were oil wells.

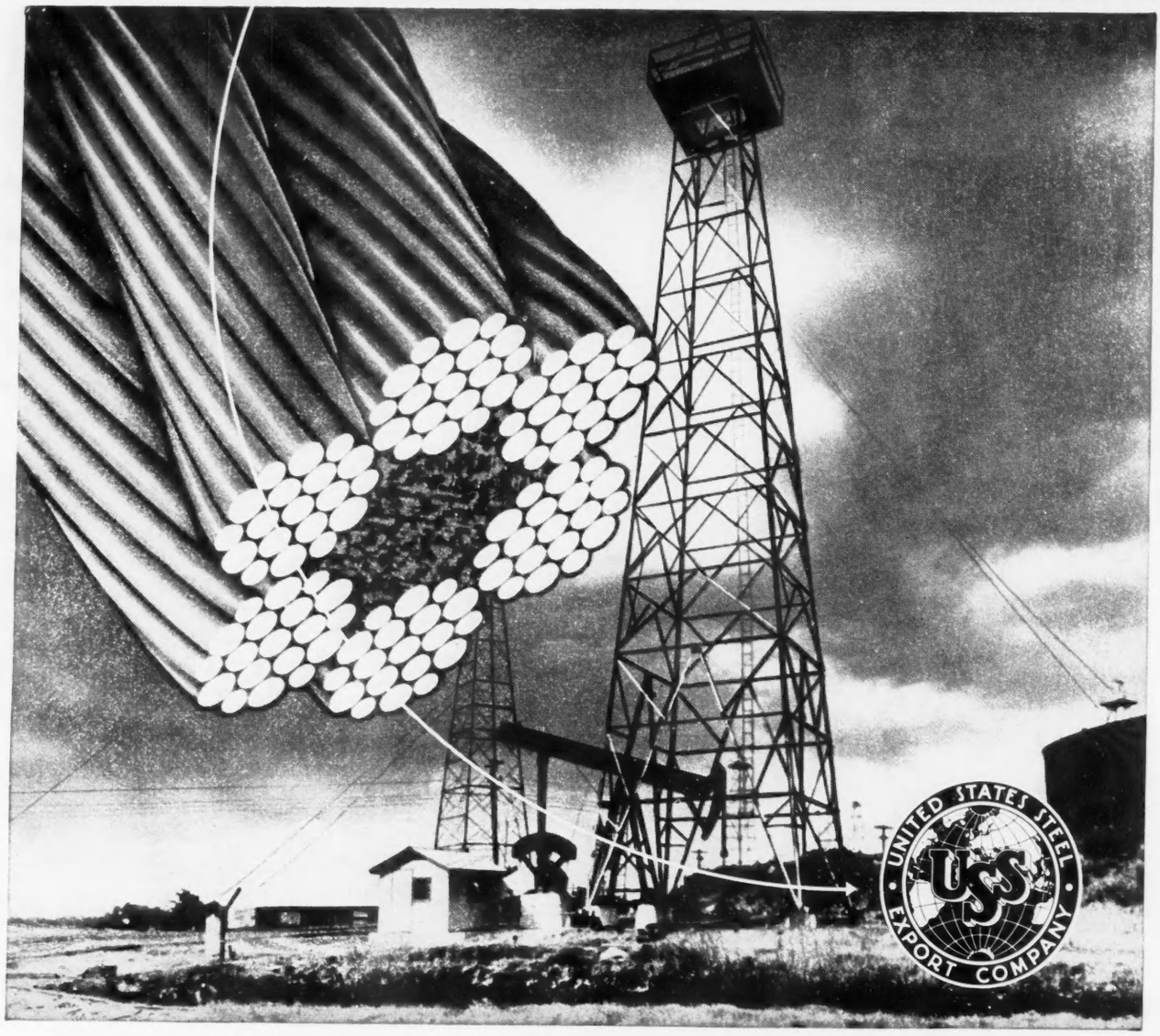
There is almost no information available on actual drilling in the Far East, including the East Indies. Operations in this area are still hampered by war destruction but this area is expected to resume operations on a limited scale during 1947 with both drilling and production slated to increase sharply.

Wells Completed in 1946 and 1945 and Number Drilling at End of Each Year, by Countries

COUNTRY	Total Wells Completed in 1945	Wells Drilling End of 1945	WELLS COMPLETED IN 1946					Wells Drilling End of 1946
			Oil	Gas	Dry	Total Wells	Total Footage	
North America Except United States:								
Canada	437	50	94	249	243	586	983,262	n.a.
Cuba	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Mexico	53	16	25	2	22	49	261,253	11
Others	3	.....	.....	.....	1	1	8,768	1
Total North America Except United States	493	66	119	251	266	636	1,253,283	12
South America:								
Argentina[1]	155	51	82	9	24	115	296,050	17
Bolivia	6	5	3	.....	.....	3	5,126	11
Brazil	12	3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Chile	1	3	1	.....	1	2	18,001	1
Colombia	59	26	89	1	28	118	454,744	22
Ecuador	54	30	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Peru	102	41	94	3	37	134	322,715	50
Trinidad	41	18	n.a.	n.a.	n.a.	120	531,458	3
Venezuela	531	94	574	.....	53	627	3,379,811	83
Total South America	961	271	843	13	143	1,119	5,007,905	187
Europe:								
Albania	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Austria	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Czechoslovakia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
France	17	18	23	10	20	53	181,413	37
Germany	n.a.	n.a.	49	.....	61	110	261,337	n.a.
Great Britain	16	5	4	.....	7	11	31,763	1
Hungary	11	n.a.	12	3	2	17	91,933	5
Italy	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Netherlands	n.a.	n.a.	7	.....	2	9	48,894	1
Poland	54	44	78	.....	9	87	105,954	n.a.
Roumania	91	42	n.a.	n.a.	n.a.	n.a.	438,505	n.a.
Russia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Total Europe	189	109	173	13	101	287	1,159,799	44
Africa:								
Algeria	n.a.	n.a.	4	.....	.....	4	3,140	n.a.
Egypt	14	n.a.	7	.....	9	16	67,441	n.a.
Morocco	18	12	3	.....	16	19	42,890	3
Total Africa	32	12	14	.....	25	39	52,471	3
Middle East:								
Bahrein Island	0	0	6	.....	.....	6	n.a.	n.a.
Iran	6	10	6	.....	.....	6	8,532	3
Iraq	.....	2	4	.....	.....	4	8,286	4
Kuwait	.....	.....	.....	.....	.....	.....	.....	2
Qatar	.....	.....	.....	.....	.....	.....	.....	.....
Saudi Arabia	4	4	11	.....	.....	11	81,220	5
Total Middle East	10	16	27	.....	.....	27	98,038	14
Far East:								
British East Indies	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Burma	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
China	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
India	n.a.	n.a.	4	.....	.....	4	31,800	3
Japan	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Netherlands East Indies	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
New Zealand	.....	.....	.....	.....	.....	.....	.....	.....
Sakhalin (U.S.S.R.)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Total Far East	n.a.	n.a.	4	n.a.	n.a.	4	31,800	3
Total Foreign[2]	**1,685**	**474**	**1,180**	**277**	**535**	**2,112**	**7,603,295**	**263**
United States[3]	**25,846**	**4,367**	**16,169**	**3,393**	**8,515**	**27,987**	**97,408,709**	**4,644**
World Total[2]	**27,531**	**4,841**	**17,349**	**3,580**	**9,050**	**30,099**	**105,012,005**	**4,907**

[1] Does not include YPF. [2] Based on available data. [3] United States total does not include input wells, disposal wells, or old wells drilled deeper which totaled 2,854. n.a. Indicates data not available.

STEEL FOR THE WORLD OF TOMORROW



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WORLD REFINING

WORLD crude oil refining facilities, considerably disrupted during the war, especially outside the United States, are estimated to have had a total daily capacity of 8,704,475 barrels at the end of 1946. This is somewhat higher than the daily average production of 7,538,085 barrels during 1946 but many plants during that period failed to reach their daily capacity. In fact, it may take two or three more years of rehabilitation work before the world refineries are operating at capacity.

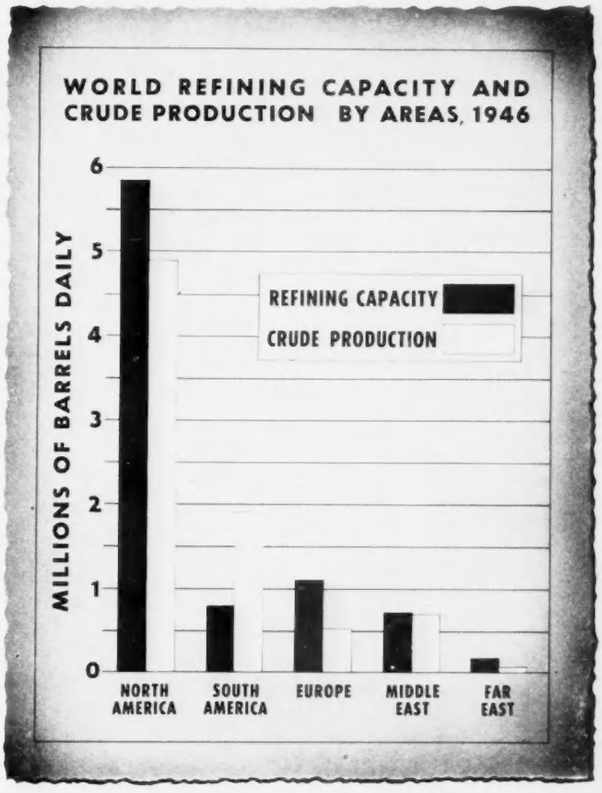
Crude oil refineries of the world are believed to number 724. However, this figure probably is high in that it likely includes some refineries which were destroyed during the war and current plans do not call for their reconstruction.

The largest concentration of refining plants is in North America. In this area there are located 416 plants with a daily capacity of 5,832,205 barrels while the daily average crude oil output during 1946 was 4,905,457 barrels. Of this total, 365 refineries, with a daily capacity of 5,400,000 barrels, are located in the United States.

Plants in South America number 57 with a daily capacity of 869,045 barrels. Current plans include expansion of the refining facilities in several Latin American countries.

There is very little actual information regarding refining facilities in Europe. It is indicated that 134 plants are located in Europe with a daily refining capacity of 1,090,175 barrels. The estimated capacity is about twice the daily crude oil production during 1946. The number of plants in Soviet Russia, including those in former Poland area and Asia Russia, is reported to be 65 with a daily capacity of 575,000 barrels.

Refineries of the Middle East total 9 with a daily capacity of 706,000 barrels. Plants in the Far East, including those in the East Indies, were damaged considerably during the war and their rehabilitation is expected to take several years.



World Refining Facilities

CONTINENT and Country	Number of Plants	Daily Refining Capacity (Barrels)	1946 Daily Crude Oil Production (Barrels)
NORTH AMERICA:			
Canada	38	254,725	20,726
Mexico	10	172,580	134,890
United States	365	5,400,000	4,749,107
Other North America	3	4,900	734
Total North America	416	5,832,205	4,905,457
SOUTH AMERICA:			
Argentina	18	100,745	56,422
Aruba	2	300,000	
Bolivia	3	1,200	948
Brazil	5	4,300	184
Colombia	2	19,300	60,444
Curacao	1	185,000	
Ecuador	3	3,300	6,485
Peru	3	29,000	34,126
Trinidad	7	94,300	55,433
Venezuela	10	123,900	1,061,605
Other South America	4	8,000	
Total South America	57	869,045	1,275,647
EUROPE:			
Albania	1	750	1,986
Austria	8	14,350	15,441
Belgium	2	12,175	
Czechoslovakia	7	12,800	556
France	17	85,000	638
Great Britain	20	114,200	1,121
Germany	14	12,000	12,696
Hungary	9	14,220	14,096
Italy	8	51,500	233
Netherlands	1	14,000	1,192
Poland	5	7,080	2,165
Roumania	24	138,000	86,203
U.S.S.R. (Russia, inc. former Poland area and Asia Russia)	65	575,000	438,227
Yugoslavia	5	8,100	
Other Europe	8	31,000	27
Total Europe	134	1,090,175	574,581

CONTINENT and Country	Number of Plants	Daily Refining Capacity (Barrels)	1946 Daily Crude Oil Production (Barrels)
AFRICA:			
Egypt	2	29,400	24,419
Other Africa	6	3,100	58
Total Africa	8	32,500	24,477
ASIA: Middle East:			
Bahrein Island	1	105,000	21,945
Iran	2	402,500	396,975
Iraq	3	7,000	89,800
Kuwait	0		16,411
Lebanon	1	1,500	
Palestine	1	90,000	
Saudi Arabia	1	100,000	165,318
Total Middle East	9	706,000	690,449
ASIA: Far East:			
Burma	3	20,000	2,054
British Borneo (Sarawak & Brunei)	1	20,000	9,589
China	6	3,600	1,403
India	3	14,600	5,932
Japan	19	40,000	3,904
Sakhalin	1	5,000	16,808
Netherland Indies	7	65,000	27,729
Total Far East	39	163,200	67,419
Other Asia	1	5,000	
Total Asia	40	874,200	757,868
AUSTRIALIA-NEW ZEALAND:			
Total	3	6,350	14
World, undistributed			41
WORLD TOTAL	724	8,704,475	7,538,085

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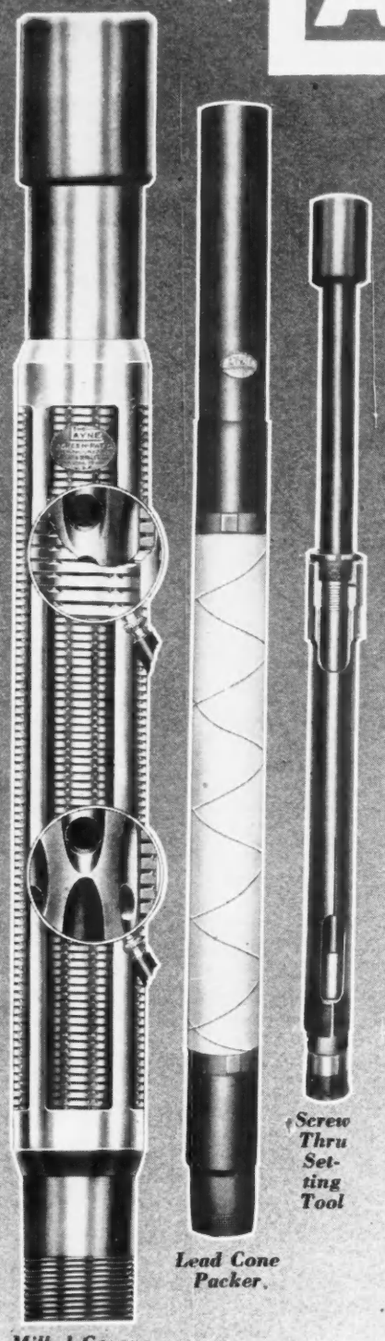

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☆ LAYNE *Screw Thru Packer*

This Packer has 42" of finely woven canvas wrapping, which when set is compressed to approximately 20", assuring a pack that needs neither fingers nor slips to prevent the packer creeping up when exposed to high pressures. Layne Packers are made for all sizes of liner, screen and casing and can be set at any depth with either drill stem or tubing. A spear or trap will remove packer if necessary.

☆ LAYNE *Screw Thru Setting Tool*

This tool is the simplest, most fool-proof setting tool on the market. When setting string is rotated eleven turns to right, the tool disengages from packer and will drop about 25 inches. It is impossible to set packer without first freeing the setting tool. The tool does not unscrew from the packer to release—instead the threads are disengaged by contraction.

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PRINCIPAL PRODUCING COMPANIES (Outside U.S.)

COMPANY	Location of Producing Fields or Concessions	Ownership
Anglo-Bahamian Pet. Co., Ltd	Bahamas	Anglo-Iranian Oil Co.
Anglo-Ecuadorian Oil Fields, Ltd.	Ecuador	British interests.
Anglo-Egyptian Oil Fields, Ltd	Egypt	Dutch-Shell Group.
Anglo-Iranian Oil Co.	Iran, Iraq, Kuwait, Bahamas (Partly through subsidiaries)	British government 56%; Burmah Oil Co., Ltd. (Dutch-Shell Group) 26%; individuals 18%.
Apex (Trinidad), Oil Fields, Ltd.	Trinidad	British interests.
Arabian American Oil Co.	Saudi Arabia	Standard Oil Co. of Calif. 30%; Standard Oil Co. (New Jersey) 30%; The Texas Co. 30%; Socony-Vacuum Oil Co. 10%.
Assam Oil Co.	India	Burmah Oil Co.
"Astra" Compania Argentina de Petroleo (Astra Pet. Co. of Argentina)	Argentina	Argentine interests.
Astra Romana	Roumania	Dutch-Shell Group.
Atlantic Refining Co.	Cuba, Venezuela, Haiti	Atlantic Refining Co.
Attock Pil Co., Ltd	India	British interests.
Australasian Pet. Co.	New Guenea	Anglo-Iranian Oil Co.; Socony-Vacuum Oil Co.
Azienda Italian Petrolia Albania	Albania	Italian Government. (Ownership may be determined by United Nations.)
Bahamas Oil Co., Ltd	Bahamas	Superior Oil Co. of California.
Bahamas Oil Exploration Co., Ltd.	Bahamas	Gulf Oil Corp.
Bahmas Mining Co., Ltd	Bahmas	
Bahrein Pet. Co.	Bahrein Islands	Standard Oil Co. of California 50%; The Texas Co. 50%.
Basrah Petroleum Co.	Iraq	Iraq Pet. Co.
Bataafsche Pet. Maatschappij	Netherlands Indies	Dutch-Shell Group, with Royal Dutch Co. owning 60%, and Shell Transport and Trading Co. owning 40%.
Beckwith and Co.	Egypt	Standard Oil Co. (New Jersey).
Braunschwerke Bohrgesellschaft	Germany	
British Bahamian Oil Dev. Co., Ltd.	Bahamas	Central Mining & Investment Co.
British Controlled Oil Fields, Ltd	Venezuela	British interests.
British Malayan Pet. Co.	British Borneo	Dutch-Shell Group.
British Oilfields of Trinidad, Ltd.	Trinidad	Dutch-Shell Group.
Burback-Kaliwerke A. G.	Germany	
Burmah Oil Co., Ltd	Burma, Iraq	Dutch-Shell Group.
Caltex Company	Australia	Standard Oil Co. of California; The Texas Co.
Cape Breton Pet. Co.	Canada	
Caracas Pet. S.A.	Venezuela	British interests.
Caribbean Pet. Co.	Venezuela	Dutch-Shell Group.
Carolina Oil Co.	Ecuador	Ecuadorian interests.
Central Area Exploitation Co.	Venezuela	British interests.
Christie Syndicate	Bahamas	Bahamas Mining Co., Ltd. (British).
Colombian Pet. Co.	Colombia	Socony-Vacuum Oil Co. 50%; The Texas Co. 50%.
Colon Development Co., Ltd.	Venezuela	Dutch-Shell Group.
Compagnie Francaise des Petroles	Iraq	Controlled by French Government. Holds 23.75% interest in Iraq Petroleum Co.
Compania Colombiana de Petroleo Eldorado., S.A. (Colombian Pet. Co.)	Colombia	The Texas Co. 50%; Socony-Vacuum Oil Co. 50%.
Compania Consolidada de Petroleo (Consolidated Pet. Co.)	Venezuela	Venezuelan Pet. Co., or subsidiary of Sinclair Oil Corp.
Compania Ferrocarrilera de Petroleo (Railroad Pet. Co.)	Argentina	British Railways of Argentina.
Compania de Petroleo Ganso Azul, Ltd. (Ganso Azul Pet. Co.)	Peru	American interests.
Compania de Petroleo Gran Colombia, S.A. (Great Colombia Pet. Co.)	Colombia	The Texas Co. 33⅓%
Compania Petrolera Lobitos (Lobitos Pet. Co.)	Peru	British interests.
Concepcion Ecuadorian Oilfields, Ltd.	Ecuador	British interests.
Concordia	Roumania	Belgian interests.
Conselho Nacional de Petroleo	Brazil	Brazilian Government.
Continental Petroleums, Ltd	Canada	
Corporacion de Fomento de la Producion	Chile	Chilean Government.
Creole Pet. Corp.	Venezuela	Standard Oil Co. (New Jersey).
D'Arcy Exploration Co., Ltd.	England	Anglo-Iranian Oil Co.
Deutsche-Amerikanische Pet.-Gesellschaft (DEUTAG)	Germany	Standard Oil Co. (New Jersey).
Deutsche Erdol-Aktiengesellschaft (DER)	Germany, Austria	
Deutsche Vacuum Oil Aktiengesellschaft	Germany	Socony-Vacuum Oil Co.
Diadema Argentina S.A. de petroleo (Diadema Pet. of Argentina)	Argentina	Dutch-Shell Group.
Ecuador Oilfields, Ltd	Ecuador	British interests.
Ecuador Tropical Oil Co.	Ecuador	Ecuadorian interests.
Establecimiento Industrial de Petroleo de Zorritos	Peru	Peruvian Government.
Erdol Produktions Gesellschaft	Austria	German.
Gaspe Oil Ventures, Ltd	Canada	
Gewerkschaft Brenner	Germany	German.
Gewerkschaft Brigitta	Germany	
Gewerkschaft Elwerath	Germany, Austria	German.
Gewerkschaft Franz	Germany	German.
Gewerkschaft Norddeutschland	Germany	German.
Glencoe Oil Co., Ltd	Canada	
Grossdeutsche Schachtbau und Tiefbohrgesellschaft	Germany	German.
Imperial Oil Company, Ltd	Canada	Standard Oil Co. (New Jersey) 70%.
Indo-Burma Pet. Co., Ltd	Burma	British interests.
International Ecuadorean Pet. Co.	Ecuador	Imperial Oil Co., a subsidiary of Standard Oil Co. (New Jersey)
International Pet. Co., Ltd	Peru, Venezuela	Imperial Oil Co., a subsidiary of Standard Oil Co. (New Jersey) has 25% interest in Mene Grande Oil Co.'s holdings in Venezuela.
International Tiefbohr-Kommandit Gesellschaft (ITAG)	Germany, Austria	
Iraq Pet. Co.	Iraq, through subsidiaries in Syria, Palestine, Lebanon, Saudi Arabia.	Anglo-Irian Oil Co. 23.75%; Dutch-Shell Group 23.75%; Near East Development Co. 23.75%; Compagnie Francaise des Petroles (French Government) 23.75%; Participations and Investments, Ltd., (British) 5%. (Near East Dev. Co. is owned jointly by Standard Oil Co. (New Jersey) and Socony-Vacuum Oil Co.)
Island Development Co., Ltd	Canada	Cities Service Oil Co.; Socony-Vacuum Oil Co.
Jordan Exploration Co., Ltd	Palestine	
Kaliwerke Salzdetfurth	Germany	
Kansu	China	Chinese Govermment.
Kern Trinidad Oilfields, Ltd	Trinidad	British interests.
Khaneh Pet. Co.	Iraq	Iraq Pet. Co.; Anglo-Iranian Oil Co.
Kohle-Ol-Union Von Busse A.G.	Germany	
Koller, Ferd. & Sohn	Germany	German.
Kuwait Oil Co., Ltd	Kuwait	Gulf Oil Corp. 50%; Anglo-Iranian Oil Co. 50%.
LaJunta Pet. Co.	Colombia	The Texas Co. 50%.
Lakes Oil, Ltd	Australia	Australian interests.
Lebanon Pet. Co.	Lebanon	Iraq Pet. Co.
Lion Oil Refining Co.	Canada	American interests.
Lobitos Oilfields, Ltd. (Compania Petrolera Lobitos)	Peru	British interests.
MacNeil, D. J.	Canada	
Magyar Amerikai Olajipari Reszvenytarasag (Hungarian-American Oil Industries Stock Co.)	Hungary	Standard Oil Co. (New Jersey).
McColl-Frontenac Oil Co.	Canada	The Texas Co. 49%.
McDonald, J. A.	Canada	
Mene Grande Oil Co.	Venezuela	Gulf Oil Corp. 50%; Dutch-Shell Group 25%; International Pet. Co. 25%; International Pet. is a subsidiary of Imperial Oil Co., which in turn is a subsidiary of Standard Oil Co. (New Jersey).
(Las) Mercedes Anonima Petrolera Sociedad	Venezuela	The Texas Co. 50%; Caracas Pet. S.A. (a British firm) 50%.
Miller, W. B.	Canada	
Mosul Pet. Co., Ltd.	Iraq	Iraq Pet. Co.
Nassau Oil Mining Co., Ltd	Bahamas	British interests.
Near East Development Company	Iraq (Owns interest in Iraq Pet. Co.)	Standard Oil Co. (New Jersey); Socony-Vacuum Oil Co.
Nederlandsche Indische Aardolie Maatschappij	Sumatra	50% Dutch-Shell Group; 50% Netherlands Government.
Nederlandsche Koloniale Pet. Maatschappij	Netherlands Indies	Standard-Vacuum Co., owned jointly by Socony-Vacuum Oil Co. and Standard Oil Co. (New Jersey).
Nederlandsche Olie Maatschappij	Venezuela	Dutch-Shell Group, owning 25% interest in Mene Grande Oil Co.
Nederlandsche Pacific Pet. Maatschappij	Netherlands Indies	Standard Oil of California 50%; The Texas Co. 50%.
Nederlandsche Nieuw Guinee Pet. Maatschappij	Netherlands New Guinea	Through subsidiaries: 40% Dutch-Shell Group; 40% Standard-Vacuum; 20% Stand-Standard Oil Co. of California and The Texas Co.
New Brunswick Gas and Oilfields	Canada	
Niederdonau Erdol G.m.b.h.	Austria	German (DEA, Wintershall, Pressag, Elwerath Cos.)
Nova Scotia Oil and Gas Co.	Canada	
Orinoco Oil Co. of Venezuela	Venezuela	
Patterson Beverly, et al	Canada	
Payette, Paul	Canada	
Pechelbronn Societe Anonyme d'Exploration Miniere	France	French Government.
Peninsular Oil Corp., Ltd	Canada	

Continued on page 55

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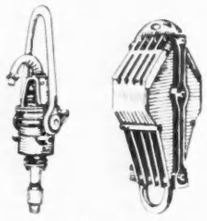

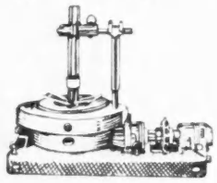

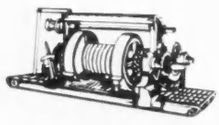

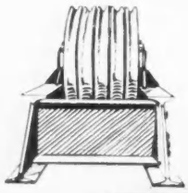

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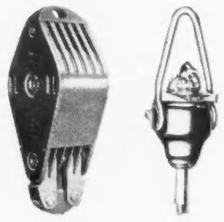

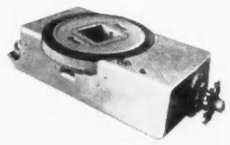

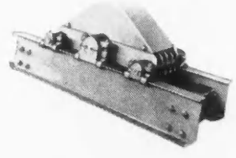

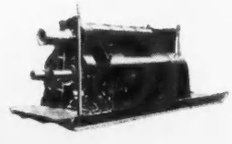

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ALASKA

THERE are three areas in Alaska where prospecting for oil has been carried on:

1) The Katalla-Yakataga District, on the Gulf of Alaska, in the southeastern part of the country, about 25 miles east of Cordova.

2) The Alaska Peninsula, including the Iniskin-Chinitna area.

3) United States Naval Petroleum Reserve No. 4, northwestern Alaska, comprising about 35,000 square miles in the Point Barrow area, on the extreme northwestern coast, beyond the Arctic Circle.

The Umiat 1, first test for oil on Naval Petroleum Reserve 4, is reported to have halted its drilling operations during the latter part of 1946 and probably will be abandoned at its present depth just below 6000 feet. The test is said to have passed through at least five sands showing oil or gas, the sands, while showing good saturation, had almost no porosity, being extremely tight and fine-grained sandstone.

Believed to be structurally low, the test will furnish information of extreme value in correlating results of a projected program of geophysical work and core-drilling to be carried out before deciding upon the next wildcat location. Drilling of the next test will be carried out by Arctic Contractors under supervision and with approval of the Operating Committee.

Meanwhile, geophysical work as well as geological mapping has gone forward, although it will probably be another year or more before all of this work is interpreted and coordinated.

The Katalla and Yakataga districts are in a large area of Tertiary rocks stretching from near the mouth of the Copper River eastward along the coast to and beyond Lituya Bay. Oil seeps were first discovered near the head of Katalla Slough in 1896, and drilling started in 1901 brought about the opening of the Katalla oil field. This field, located on a low divide near the discovery seeps, had about 20 productive wells ranging in depth from 365 to 1800 feet and over a 30-year period (1902-33) produced about 150,000 barrels of high-gravity paraffin-base oil. The field has not produced since 1933, when a small refinery there burned down. This refinery had supplied gasoline to the fishing fleet at Cordova, and fuel to other customers. Additional geological study has been made in the Katalla area and some oil and gas seeps have been located on Bering River, Bering Lake and in the Nichawak region.

Oil seeps on the creeks near the coast east of Cape Yakataga has drawn some attention to the Yakataga district. General Petroleum Corporation drilled a wildcat test in 1926-27 in this region but encountered no oil.

The Alaska Peninsula-Cook Inlet district has been the site of several wildcat tests since the turn of the century. Indications of petroleum have been recognized at intervals throughout a tract that extends for more than 250 miles along the eastern flank of the peninsula. Most active search for oil has been made in the past in the Iniskin-Chinitna area, Cold Bay, Jute Bay, Portage Bay, and Wide Bay areas.

On the Iniskin Peninsula work has been concentrated in the Fitz Creek region, locale of the principal known structure. This region also is the site of Iniskin Drilling Company's Iba Well No. 1 which was drilled in 1936-39. The well, bottomed at 8775 feet, is credited with having produced a few barrels of 46.8-gravity oil. It was a paraffin-base crude yielding 59 percent gasoline and having a low sulphur content. This is Alaska's deepest test for oil. Earlier drilling on the Iniskin Peninsula was in the vicinity of Oil Bay, where four wells were drilled in the period 1898-1906 by Alaska Petroleum Company. The first test was reported to have drilled to more than 1000 feet and was credited with finding some oil between 500 and 700 feet, with gas being encountered at various depths. The other three wells were abandoned at depths less than 1000 feet.

In 1902-03, the Alaska Oil Company drilled two shallow tests at Dry Bay, the deepest being about 320 feet.

Principal Producing Companies Outside the United States and Their Ownership

Continued from page 53

COMPANY	Location of Producing Fields or Concessions	Ownership
Petroleos Mexicanos	Mexico	Mexican Government.
Petroleum Development Co. of Palestine, Ltd	Palestine	Iraq Pet. Co.
Petropolis Oil Company	Ecuador	Ecuadorian interests.
Picton Pet. Co., Ltd	Canada	
Premier (Trinidad) Oilfields, Ltd	Trinidad	British interests.
"Preussag" Preussische Bergwerke und Hutten Aktiengesellschaft	Germany	
Reemtsma, Ph.	Germany	
Regie Autonome des Petroles	France	French Government.
Richmond Pet. Co.	Colombia	Standard Oil Co. of California.
Ritz, Louis & Co.	Germany	
Rohoel Gewinnungs Aktiengellschaft (RAG)	Austria	Socony-Vacuum Oil Co. 50%; Dutch-Shell Group 50%.
Romano Americana	Roumania	Standard Oil Co. (New Jersey).
Russo-Iranian Oil Co.	Iran	Russia 51%; Iran 49%.
Sarawak Oilfields, Ltd	Sarawak	Dutch-Shell Group.
Shell Co. of Ecuador	Ecuador	Dutch-Shell Group.
Shell Overseas Exploration Co., Ltd.	Bahamas	Dutch-Shell Group.
Sociedad Anonima Petrolera Las Mercedes	Venezuela	The Texas Co. 50%.
Societa Italiana del Petrolio el Affini (NAFTA)	Italy	Dutch-Shell Group.
Societa Petrolifera Italiana (SPI)	Italy	Standard Oil Co. (New Jersey).
Societe Nationale des Petroles D'Aquitaine	France	French Government 35%; French Private interests 45%.
Societe Nationale des Petroles du Languedoc Mediterraneen	France	French Government 35%; French Private interests 45%.
Societe Unirea de Petroleo (Unirea)	Roumania	British.
Socony-Vacuum Oil Co., C.A.	Venezuela	Socony-Vacuum Oil Co.
Socony-Vacuum Oil Co., Inc.	Egypt	Socony-Vacuum Oil Co.
Sovmagnafta Company	Hungary	Hungarian Government 50%; Russian Government 50%. Since war operating all oil properties in Hungary.
Sovrompetrol Oil Co.	Roumania	Russian and Roumanian Governments. Now operating prewar properties of Concordia (Belgium), Columbia (French), Creditul Minier, Redeventza and IRDP companies
Standard Oil (Bahamas) Ltd	Bahamas	Standard Oil Co. (New Jersey).
Standard Oil Co. of Egypt	Egypt	Standard Oil Co. (New Jersey).
Standard Oil Co., S.A. Argentina	Argentina	Standard Oil Co. (New Jersey).
Standard-Vacuum Oil Co.	Netherlands Indies.	Socony-Vacuum Oil Co. 50%; Standard Oil Co. (New Jersey) 50%.
Steaua Romana	Roumania	German, English, French, Roumanian.
Steinberg-Naphtha	Austria	German (ITAG, Elwerath).
Structure Drilling Co.	Canada	
Sydney Pet. Co.	Canada	
Syria Pet. Co.	Syria	Iraq Pet. Co.
Tampico Texas Pet. Corp.	Canada	
Teikoku (Imperial) Oil Co.	Japan	Japanese interests.
Texas Petroleum Co.	Venezuela, Colombia	The Texas Co.
Trinidad Consolidated Oilfields, Ltd.	Trinidad	British interests.
Trinidad Leaseholds, Ltd.	Trinidad	British interests.
Trinidad Oilfields Operating Co., Ltd.	Trinidad	Standard Oil Co. (New Jersey).
Trinidad Pet. Dev. Co., Ltd.	Trinidad	British interests.
Tropical Oil Co.	Colombia	Standard Oil Co. (New Jersey) through International Pet. Co., subsidiary of Imperial Oil Co.
Union Oil Paraguay	Paraguay	Union Oil Co. of California.
United British Oilfields of Trinidad, Ltd.	Trinidad	British interests.
Venezuela Oil Concessions, Ltd.	Venezuela	Dutch-Shell Group.
Venezuelan Pet. Co.	Venezuela	Sinclair Oil Corp.
Westdeusche Bohrgesellschaft (Siep & Co.)	Germany	
Wintershall Aktiengesellschaft	Germany, Austria	
Yacimientos Petrolifera Fiscales (Bolivia	Bolivia	Bolivian Government.
Yacimientos Petroliferos Fiscales (Y.P.F.)	Argentina	Argentine Government.

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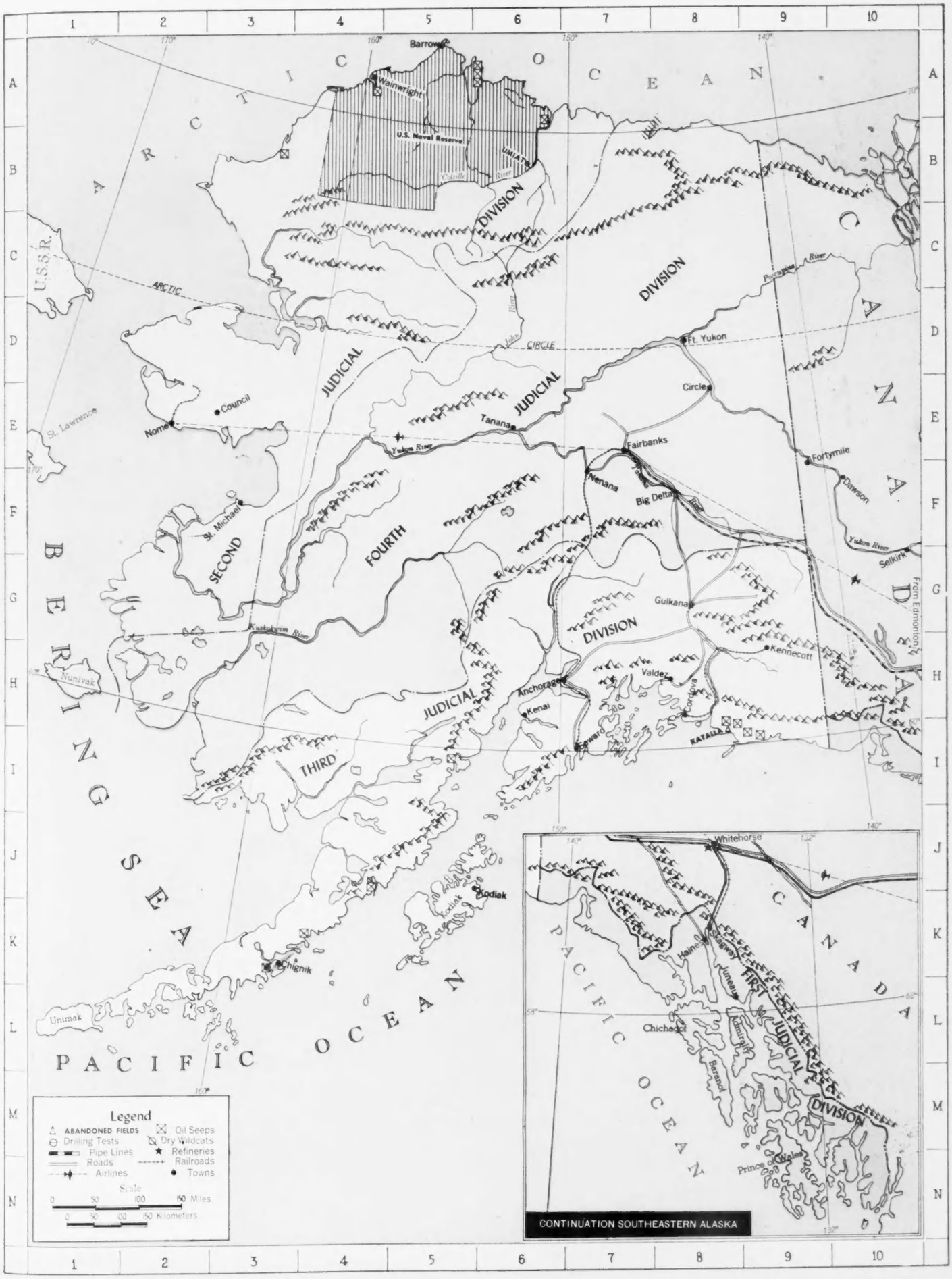
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Wainwright
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Umiat
Colville River
DIVISION
ARCTIC OCEAN
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ARCTIC CIRCLE
Porcupine River
Yukon River
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Tanana
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Nenana
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0 50 100 150 Kilometers
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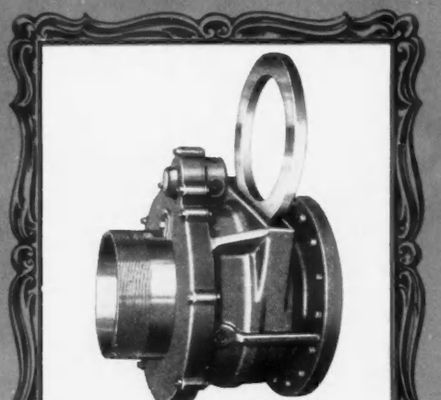
ASA 1500 lb.—5000 lb. W.O.G.



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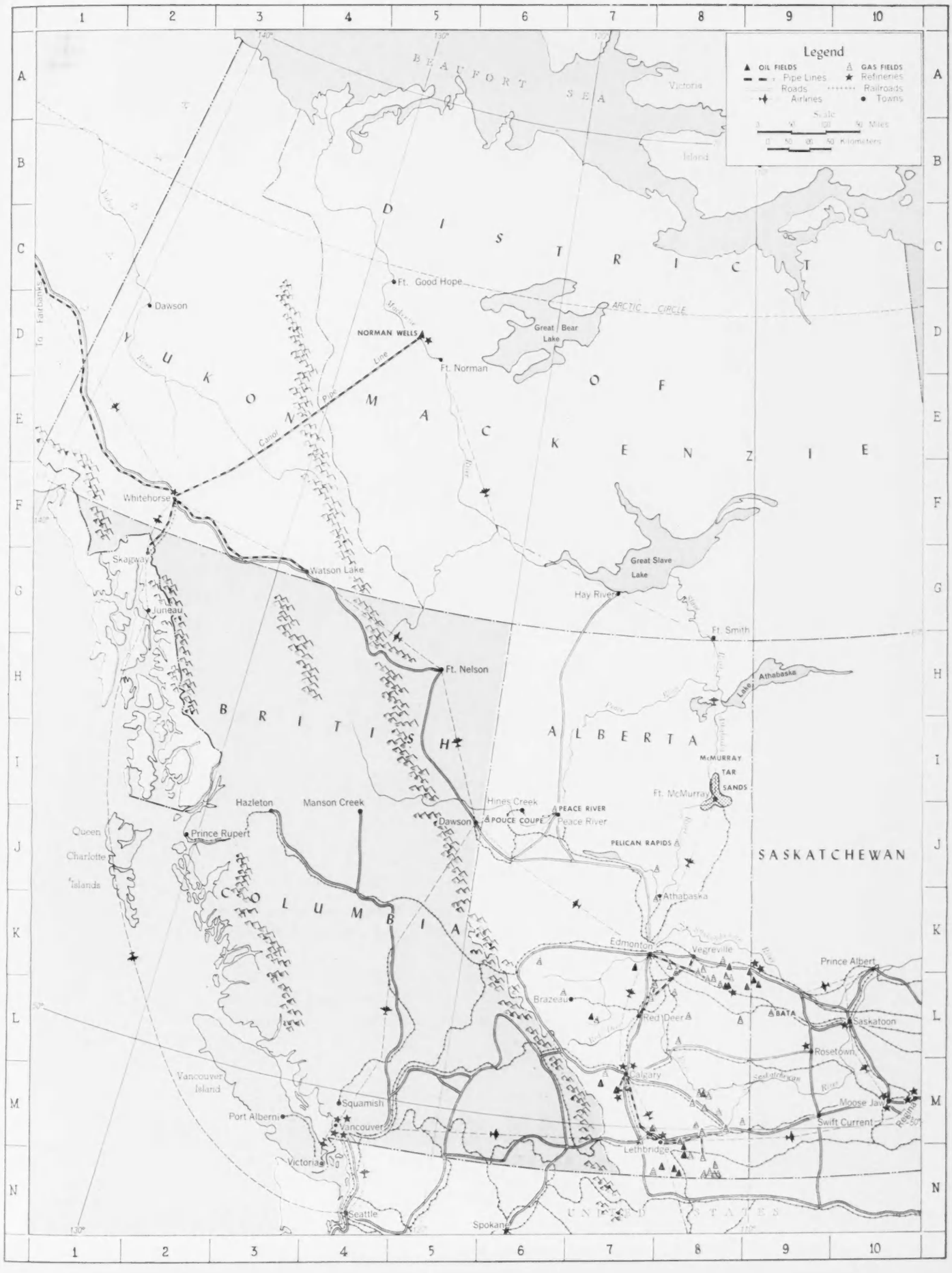
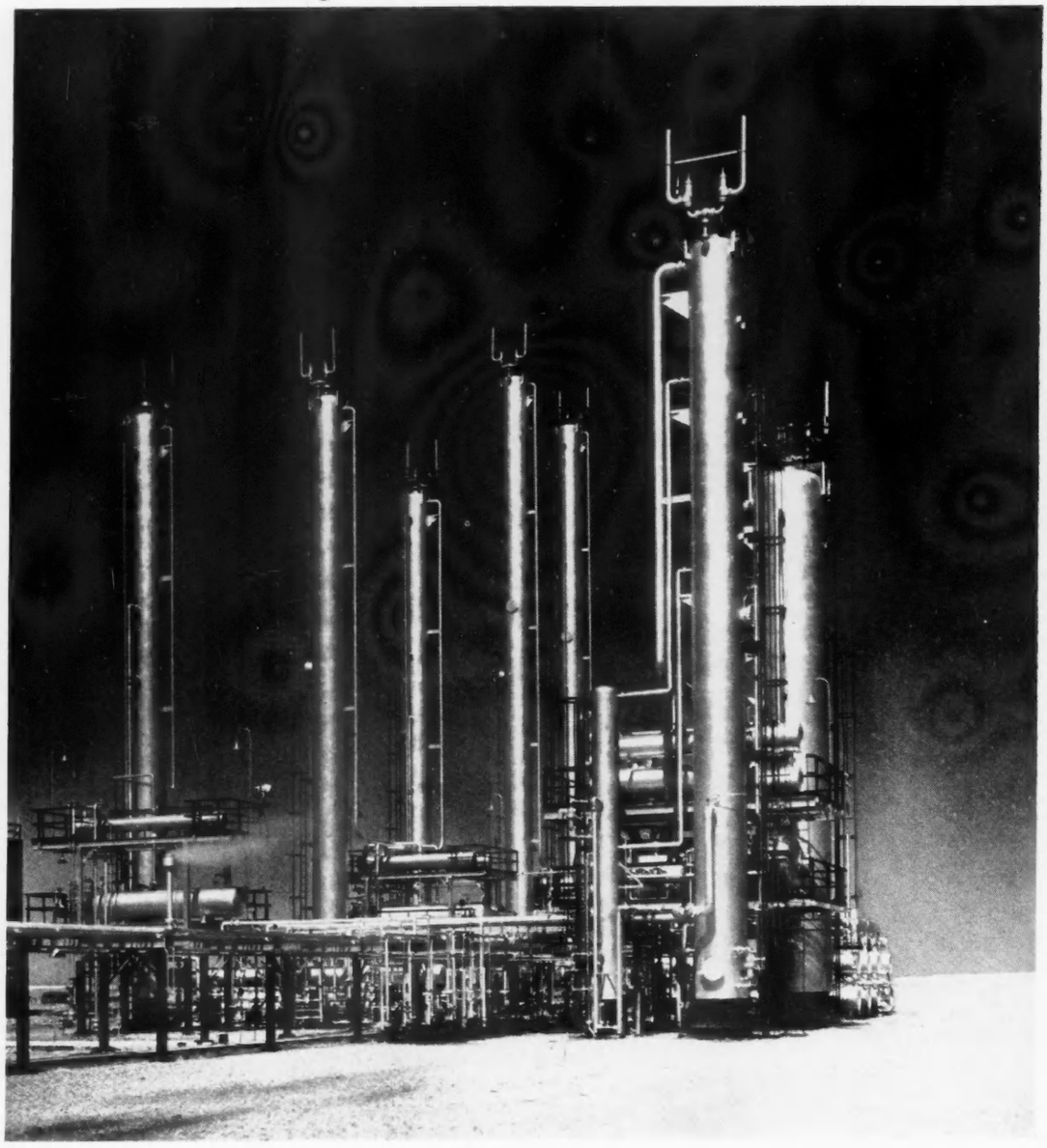
CANADA—Western





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CANADA

THE petroleum industry of western Canada received its greatest recent encouragement in February, 1947, when Imperial Oil Ltd.'s Leduc 1, in the great belt of virgin plains territory in central Alberta, was completed with an initial flow of 900 barrels of 38-39-gravity (API) crude oil from a Devonian limestone zone at 5029-66 feet. Restricted to a quarter-inch choke following a 14-hour flush flow, the well's output was about 8000 barrels during the first month it was on production. As yet, the well has not been acidized.

The Leduc discovery, coupled with the Lloydminster and South Princess successes of 1946 and the gas developments at Viking-Kinsella and Pakowki-Pinhorn have assured 1947 will be a record oil and gas exploration year for western Canada.

More than six million acres of oil and gas rights have been taken up in a belt 250 miles long and up to 100 miles wide concentrating on Leduc, with Imperial Oil, McColl-Frontenac, Gulf Research and Development Company and California-Standard the dominant holders, together with a considerable number of independent operators. An extensive geological and geophysical program, coupled with structure test drilling and a considerable number of deep tests, is planned for the year.

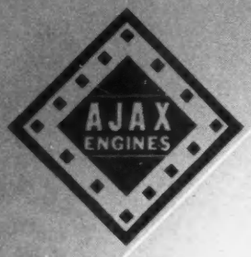
In the general Lloydminster area, drilling plans by independents call for more than 100 wells, most of them within the area outlined by exploratory successes in 1946, plus a number of wildcats to test both the Lower Cretaceous and underlying Devonian. Marketing outlook for Lloydminster's heavy crude has been substantially improved by long-term plans by Husky Refining Company for development of a larger asphalt market in western Canada. Husky will have a 2500-barrel capacity asphalt plant in operation in 1947 and plans to eventually expand the capacity to 7500 barrels as field potential and market warrant.

1946 Discoveries

The year 1946 brought emergence of the Alberta Plains as one of the great natural gas reserves of the continent. Imperial Oil, in an energetic exploration program seeking gas reserves for a possible gas synthesis industry, boosted proven area of the old Viking-Kinsella gas fields in Central Alberta from about 50,000 acres to more than 250,000 acres and established a gas reserve variously estimated at 1000 to 1500 billion cubic feet. McColl-Frontenac Oil Company and Union Oil of California, seeking gas for the same purpose, established a reserve of at least 100 billion cubic feet in the

Engineering and Geological Data on Canadian Fields

FIELD and PROVINCE	Est. Proved Area (Acres)	Gravity of Oil (API)	PRODUCING FORMATION						
			Local Name	Kind	Geologoc Age	Depth of Wells (Ft.) Minimum Top Pay	Depth of Wells (Ft.) Maximum Depth Wells	Average Thickness of Pay (Feet)	Type Structure
Alberta:									
Armelgra		18	Ellis	Sand	Jurassic	3100			Unknown
Athabaska	25,000	Gas	Labiche	Sand	Cretaceous	600	1300		Strat-Trap
Barnwell	5,000	Gas	Bow Island	Sand	Cretaceous	2150		10	Monocline
Bow Island	10,000	Gas	Bow Island	Sand	Cretaceous	1900	2255	9	Dome
Brooks	2,500	Gas	Milk River	Sand	Cretaceous	1199	1250	100	Strat-Trap
Conrad	1,000	26	Ellis	Sand	Jurassic	2960	3125	13	Strat-Trap
Del Bonita	200	36–38	Madison	Lime	Miss.	5054		12	Anticline
Dina	400	14–15	Meridian	Sand	Cretaceous	1680	1900	15	Strat. Trap
Fabyan	200	Gas	Viking	Sand	Cretaceous	1585	1900	10	Strat. Trap
Foremost	5,000	Gas	Bow Island	Sand	Cretaceous	2050	2250	9	Anticline
Keho Dome		32	Bow Island	Sand	Cretaceous	3680		5	Anticline
Kinsella-Viking	250,000	Gas	Viking	Sand	Cretaceous	2100	2200	10	Strat. Trap
Hay Lake	100	30	Madison	Lime	Miss.	3094		4	Dome
Jumping Pound		46	Madison	Lime	Miss	9900		300	Anticline
Lloydminster-Lone Rock	20,000	14–18	Skarky	Sand	Cretaceous	1750	2000	10	Strat. Trap
Medicine Hat	40,000		Medicine Hat	Sand	Cretaceous	900	1250	20	Strat. Trap
Moose Dome	200	47.7	Fairholme	Lime	Devonian	1534			Dome
Princess	200	34.5	Devonian	Lime	Devonian	3980	4000	18	Dome
Princess	200	26–28	Sunburst	Sand	Cretaceous	3177		35	Strat. Trap
Princess	200	26	Madison	Lime	Miss	3300	3320	5	Strat. Trap
Red Coulee	150	31.5	Vanalta	Sand	Cretaceous	2417	2475	30	Terrace
Skiff			Ellis	Sand	Jurassic	3054	3080		Unknown
Suffield	2,000		Medicine Hat	Sand	Cretaceous	980	1130	40	Strat. Trap
Taber	760	17–23	Taber	Sand	Cretaceous	3082	3260	23	Strat. Trap
Tilley		27	Sunburst	Sand	Cretaceous	3170		10	Strat. Trap
Turner Valley	25,000	37–64	Madison	Lime	Miss	3400	9600	450	Anticline
Twin River		36.6	Madison	Lime	Miss	3913	3964		Anticline
Vermilion	1,000	14	Vermilion	Sand	Cretaceous	1870	1980	5	Strat. Trap
Wainwright	12,000	22	Wainwright	Sand	Cretaceous	2200	2300	10	Anticline
South Princess	500	26–28	Madison	Lime	Miss	3271	3326	20	Dome
Leduc		39	Devonian	Lime	Devonian	5029	5066	37	Unknown
Pakowki-Pinhorn	25,000	Gas	Bow Island	Sand	Cretaceous	2000	2200		Strat. Trap
Ontario:									
Bothwell	400	36	Onondaga	Lime	Devonian	395	410		Anticline
Brant		Gas	Medina-Cataract	Lime-Sand	Silurian	360	532		Monocline
Dawn	600	40	Onodaga	Lime	Devonian	320	370		Dome
Dawn	600	36	Guelph-Salina	Lime	Silurian	1630	1800		Dome
Declute	600	Gas	Guelph-Salina	Lime	Silurian				Anticline
Dover	900	36	Trenton	Lime	Ordovician	2950	3300		Fault
Dunwich	500		Onondaga	Lime	Devonian	3300	400		Dome
Elgin		Gas	Clinton	Lime	Silurian	1250	1400		Monocline
Essex	2,000	40	Guelph-Salina	Lime	Silurian	900	1100		Anticline
Haldimand	145,000	Gas	Medina-Cataract	Sand-Lime	Silurain	350	900		Monocline
Kent	15,000	Gas	Guelph-Salina	Lime	Silurian	1200	1400		Dome
Lincoln	5,400	Gas	Medina-Cataract	Sand-Lime	Silurian	315	500		Monocline
Middlesex	200	Gas	Grimsby	Lime	Silurian	1450	1500		Monocline
Mosa	4,000	Gas	Widder	Lime	Devonian	275	425		Dome
Norfolk	18,900	Gas	Clinton	Lime	Silurian	870	1200		Lens
Oil Springs	750	38	Onondaga	Lime	Devonian	370	400		Dome
Onondaga	1,920	39	Medina-Cataract	Sand	Silurian	480	650		Monocline
Petrolia	8,000	36	Onondaga	Lime	Devonian	470	510		Anticline
Thamesville	300	Gas	Onondaga	Lime	Devonian	370	380		Anticline
Tilburg	3,000		Guelph-Salina	Lime	Silurian	1050	1400		Anticline
Welland	38,000	Gas	Medina	Lime	Silurian	400	910		Monocline
Wentworth	6,000		Clinton	Lime	Silurian	300	440		Monocline
New Brunswick:									
Stony Creek	1,625				Miss	1500	3200		Anticline-Monocline



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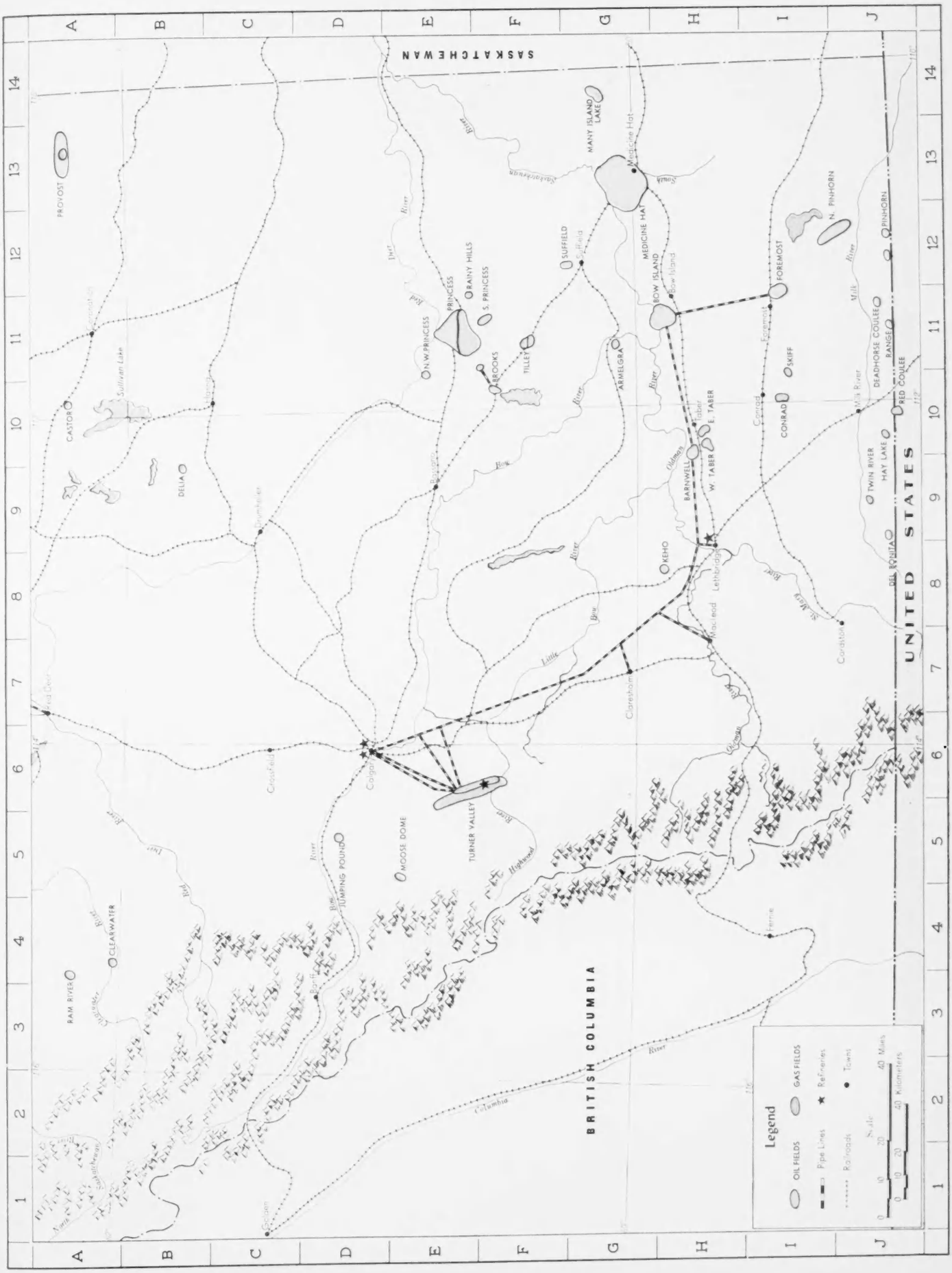
CANADA—Southern Alberta Fields



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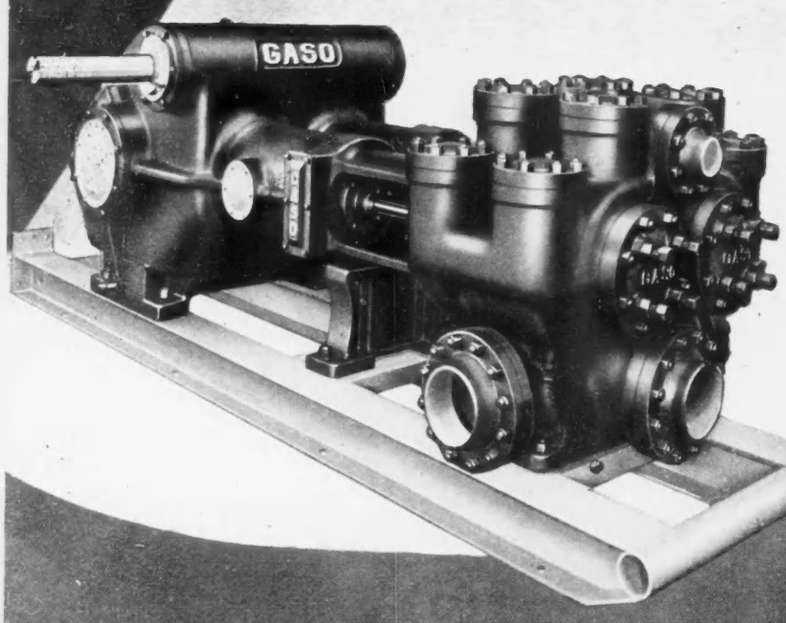

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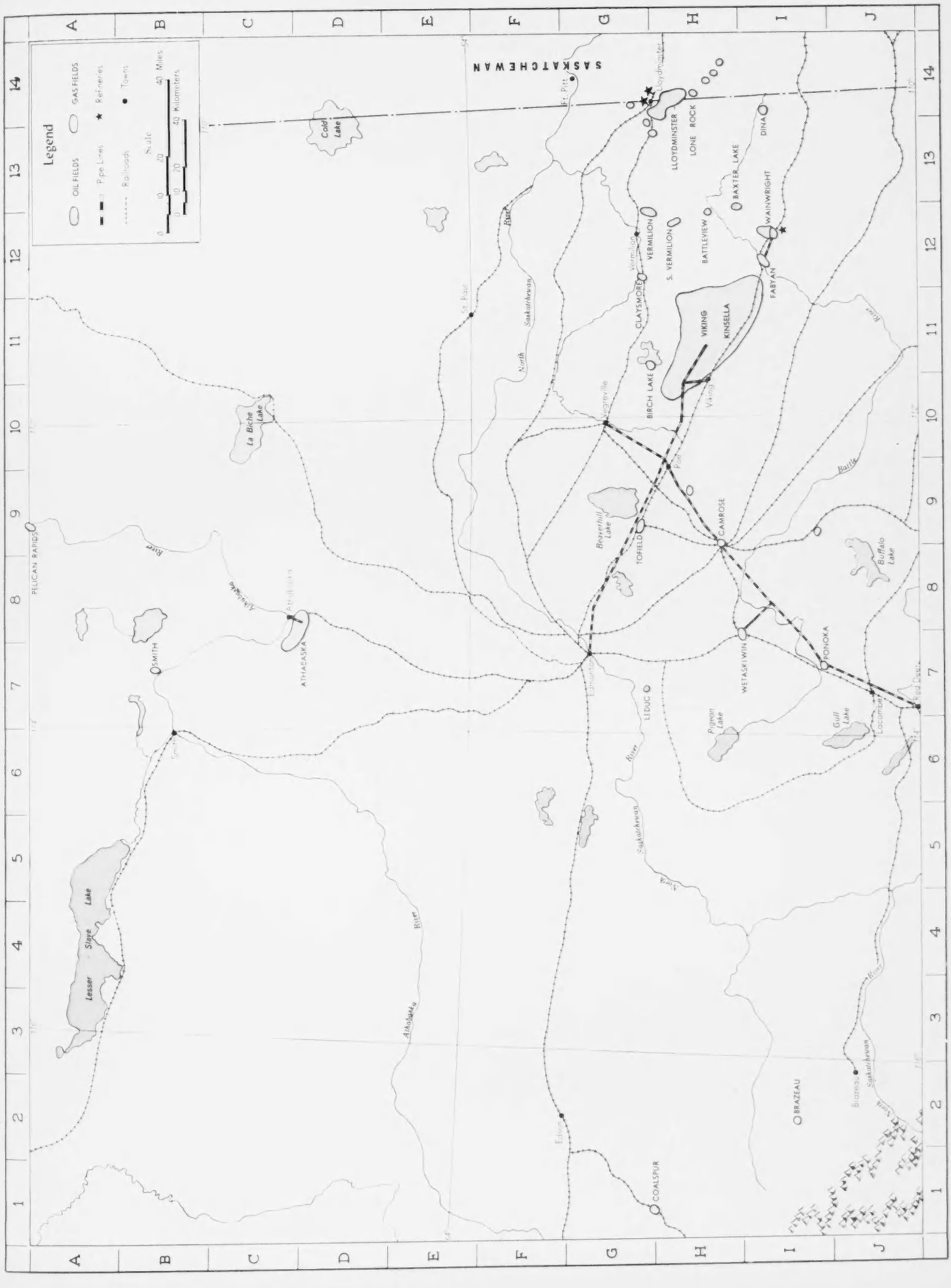
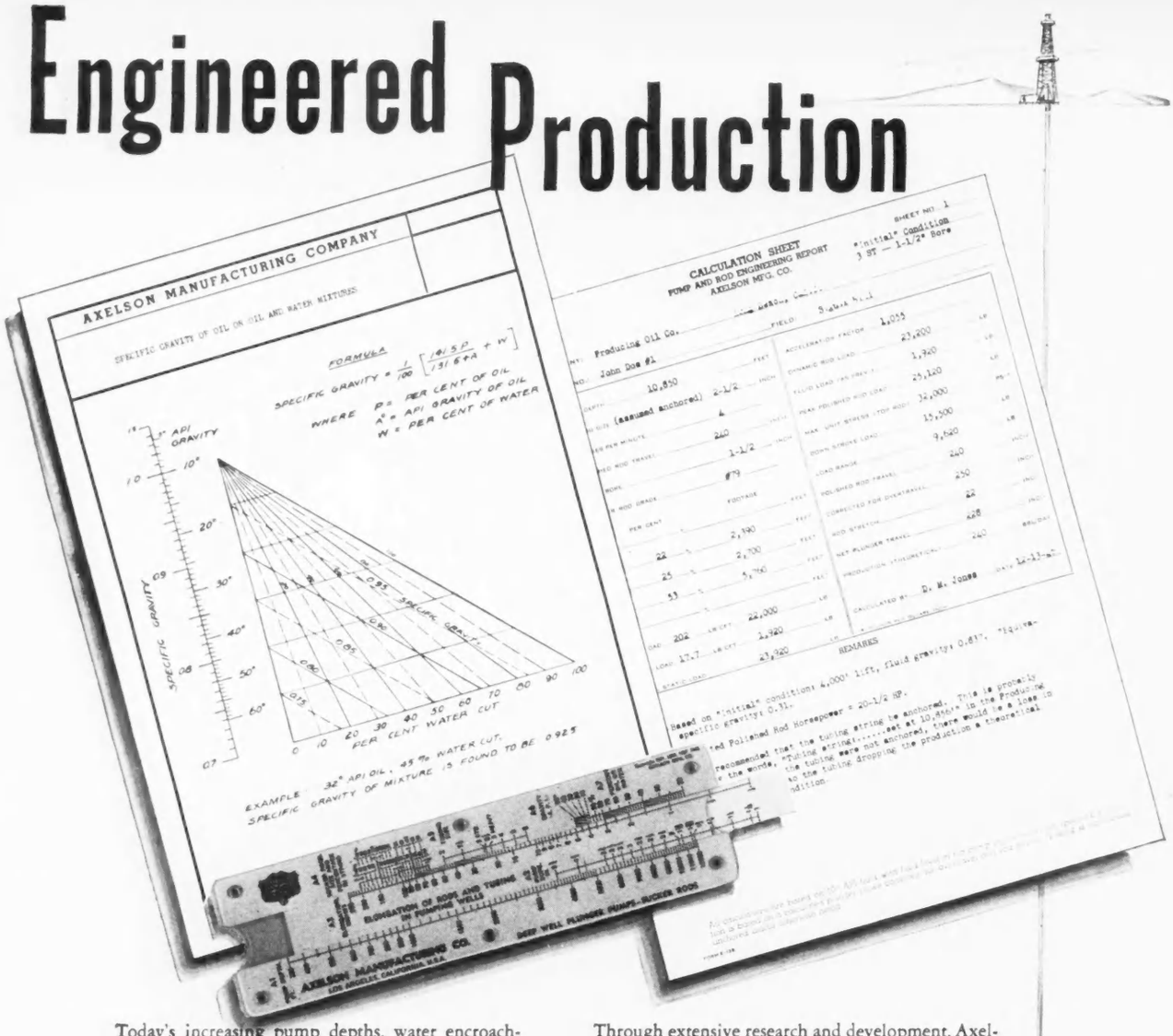
CANADA—Central Alberta Fields



Engineered Production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SPECIFIC GRAVITY OF OIL OR OIL AND WATER MIXTURES
FORMULA
SPECIFIC GRAVITY = 1/100 [(141.5 P)/(131.5 + A) + W]
WHERE P = PER CENT OF OIL
A° = API GRAVITY OF OIL
W = PER CENT OF WATER
° API GRAVITY
SPECIFIC GRAVITY
PER CENT WATER CUT
EXAMPLE: 32° API OIL; 45% WATER CUT.
SPECIFIC GRAVITY OF MIXTURE IS FOUND TO BE 0.925
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CANADA—Continued

Pakowki-Pinhorn area, southeast Alberta Plains, in 1946 and in early 1947 continued exploration boosted reserves to more than 250 billion cubic feet. The two companies' program for 1947 call for a minimum of 25 tests in the Pakowki-Pinhorn-Foremost region.

Lloydminster, for several years a minor source of heavy (14 to 17-gravity, API) crude on the Alberta-Saskatchewan border, emerged as a major reserve in 1946 as a result of successful exploratory drilling over an area of 60,000 acres. The widely spaced successes will be followed in 1947 by an extensive drilling program. Oil sources are Lower Cretaceous sands found at depths of 1750 to 2000 feet. Responsible for the expansion are a number of independent companies.

Second important oil success of 1946 was the discovery of 27-gravity oil in the Madison limestone in the South Princess area, south Alberta Plains. The discovery well, drilled by California-Standard and a group of independents, flowed 200 barrels daily through a 12/64-inch choke. Severe winter weather prevented follow-up development in 1946, but a widespread drilling program is slated for 1947.

For the first time since the Turner Valley field passed its peak in 1942, the Western Canadian oil industry sees in 1947 a prospect of arresting and perhaps reversing this downward production trend. Turner Valley, which produced 6,371,572 barrels in 1946, is expected to slump another million barrels in 1947. Other Alberta and Saskatchewan fields, which produced just over 900,000 barrels in 1946, are expected to show a sharp increase in 1947, particularly Leduc, Lloydminster and South Princess.

Eastern Area

Crude oil output in Eastern Canada in 1946 totaled 147,920 barrels, a slight increase over production in 1945. Ontario Province accounted for 119,336 barrels, and New Brunswick, 28,584 barrels.

A small oil and gas area was discovered early in 1946 in southwestern Lambton County, Ontario, about three miles west of Wallaceburg by Eastern Canada Explorations, a subsidiary of Imperial Oil Company, Ltd. The discovery was made in the Lower Silurian (Salina) beds between 1830 and 1900 feet. Six gas wells have been completed producing an average of 1½ million cubic feet of gas while one oil well produces between 15 and 20 barrels daily.

Operations continued on Gaspe Peninsula, eastern Quebec Province, but no discoveries were made.

In the Stony Creek field, near Moncton, New Brunswick Province, four new gas wells were drilled and five wells were deepened to lower productive sands. Total drilling amounted to 9532 feet. (Continued on page 73.)

Producing Wells and Oil Production in Eastern Canada

FIELD and PROVINCE	Year of Discovery	Oil Wells at End of 1946		Crude Oil Production (Barrels)			
		Shut in	Producing†	Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
Bothwell & Thamesville, Ontario	1895	127	173	47.0	22,791	18,610	2,766,000
Dunwich, Ontario	1898	70	20	4.2	1,676	1,621	194,470
Moore, Ontario	1904	37	7	.6	247	259	434,300
Mosa, Ontario	1904	36	152	53.0	14,344	17,351	492,980
Oil Springs, Ontario	1861	96	707	81.0	25,657	27,888	8,054,500
Onondaga, Ontario	1910	5	3	.05	24	30	34,400
Petrolia, Ontario	1865	240	480	121.0	39,350	43,195	26,233,000
Plympton, Ontario	1875	2	1	.05	9	28	170,000
Sarnia, Ontario	1875	5	6	.5	190	152	315,000
Dover, Raleigh-Romney, Ontario	1917	..	12	11.5	5,805	4,580	203,800
Dawn, Trenton, Ontario	1932	..	1	.3	285	222	54,600
Warwick & Metcalfe, Ontario	1938	42	16	11.3	2,739	5,400	114,000
Totals	....	660	1,578	58.7	113,117	119,336	39,057,050

† All wells on Artifical Lift

Producing Wells and Oil Production in Western Canada

FIELD, PROVINCE	Year of Discovery	OIL WELLS AT END OF 1946				CRUDE OIL PRODUCTION (Barrels)			
		Shut in	Producing			Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
			Flowing	Art. Lift	Total Producing				
ALBERTA:									
Turner Valley:									
Limestone (Oilwells)	1936	....	317	....	317	14,775	6,980,838	5,902,686	72,313,064
Limestone (Gaswells)	1924	....	56	....	56	116	24,751	25,788	8,823,361
Shallow Oilwells	1914	....	1	4	5	20	3,932	8,888	502,428
Natural Gasoline	....	....	....	....	....	1,344	412,540	434,210	5,862,740
Total Turner Valley		....	374	4	378	16,255	7,422,061	6,371,572	87,501,593
Armelgra	1943	1	....	....	....	....	....	....	462
Baxter Lake	1946	....	....	1	1	10	....	2,016	2,016
Conrad	1944	2	....	16	16	480	143,696	212,645	381,074
Del Bonita-Twin River	1939	2	....	....	1	....	4,091	2,064	32,925
Dina Ribstone	1929	....	....	....	....	....	....	....	37,352
Hay Lake Dome	1946	1	....	....	....	....	....	1,140	1,140
Jumping Pound	1944	....	1	....	1	2	3,471	2,428	5,899
Keho Lake	....	....	....	....	....	....	....	....	955
Lloydminster	1940	9	....	18	18	259	28,321	76,187	116,333
Moose Dome	1937	1	....	....	....	....	....	....	8,977
Princess-Steveville	1940	4	3	....	3	108	58,539	49,068	152,312
Provost	1946	1	....	....	....	....	....	1,558	1,558
Ram River	1944	1	....	....	....	....	....	....	207
Red Coulee	....	....	....	....	....	....	....	....	328,711
Skiff	....	....	....	....	....	....	....	....	8,298
South Princess	1945	2	2	....	....	73	4,838	15,885	20,723
Taber	1937	3	1	12	13	556	135,000	206,925	634,135
Tilley	1942	1	....	....	....	....	593	....	14,513
Vermilion	1939	4	....	47	47	469	238,358	183,946	840,054
Wainwright	1922	1	....	6	6	20	16,472	13,098	236,123
Total Other Fields		35	7	100	106	1,977	633,379	766,960	2,823,797
Alberta Totals		35	381	104	484	18,232	8,055,440	7,138,532	90,325,390
SASKATCHEWAN:									
Lloydminster-Lone Rock	1945	22	1	20	21	462	16,508	136,864	153,702
Northwest Territories:									
Norman Wells	1920	....	....	?	....	?	353,137	170,198‡	2,154,425‡
Western Canada Totals	....	57	382	124	506	18,694[1]	8,425,085	7,445,594‡	92,633,517‡

NOTE: ‡ Northwest Territories 1946 production January to October only, November and December not yet received. Western Canada 1946 and cumulative totals thus less than actual yield. [1] Not including Northwest Territories.

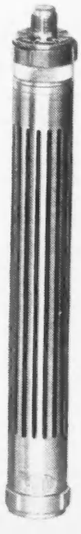
"Sure—but no worse than some oil men I've known"

"Way I look at it, trying to drill a good vertical oil well without knowing, every foot of the way, exactly what the hole's doing, is just as foolish as a car driver speeding along without lights in pitch darkness. Maybe more so—the car driver can sometimes feel when he leaves the road . . . you know, gravel under the wheels, a bumpy shoulder . . . but a driller can't 'feel' when the hole starts off at an angle. Anyway, both spell 'trouble.'

"Of course, there's a simple way out. Just as the driver can switch on his headlights, the driller can throw light on his road with a reliable, easy-to-read inclination recorder. Frequent readings with such an instrument give the driller what he's got to have for controlled vertical drilling—accurate knowledge of just what's happening below. If the hole's going straight, his weight and speed are confirmed; if it's developing an angle, he learns that in time to correct it easily. Which is mighty important, because every driller knows how quickly a ½-degree angle can grow to 3½ degrees, or more. And that can mean real trouble.

"Personally, I like the Totco best of all inclination recorders. Why? A lot of good reasons. First, because it's dead accurate, right down to tiny fractions of a degree. And I know I can depend on it staying accurate, month after month. Next, it's easy to operate . . . anyone can run it, anyone can read its records. And you can run a Totco practically any time, there are 5 different ways of running it, one to suit every situation. That saves time, makes it easy to take frequent readings. I'm not alone in that preference . . . there are thousands of tool pushers and drilling superintendents who use Totcos for the same reasons I do—unfailing accuracy, dependability, ease of operation. That's why you find Totcos all over the world.

"Sure, good wells have been drilled without inclination records—and men have crawled home safely in the dark without lights. But in driving it's simpler, and quicker, and safer to turn on the car lights at night. And in drilling you'll make a straighter hole, and make it faster, when you use frequent Totco readings to help determine the best drilling weight and speed for every condition. Use a Totco; pay attention to what it tells you—and you won't be drilling in the dark."



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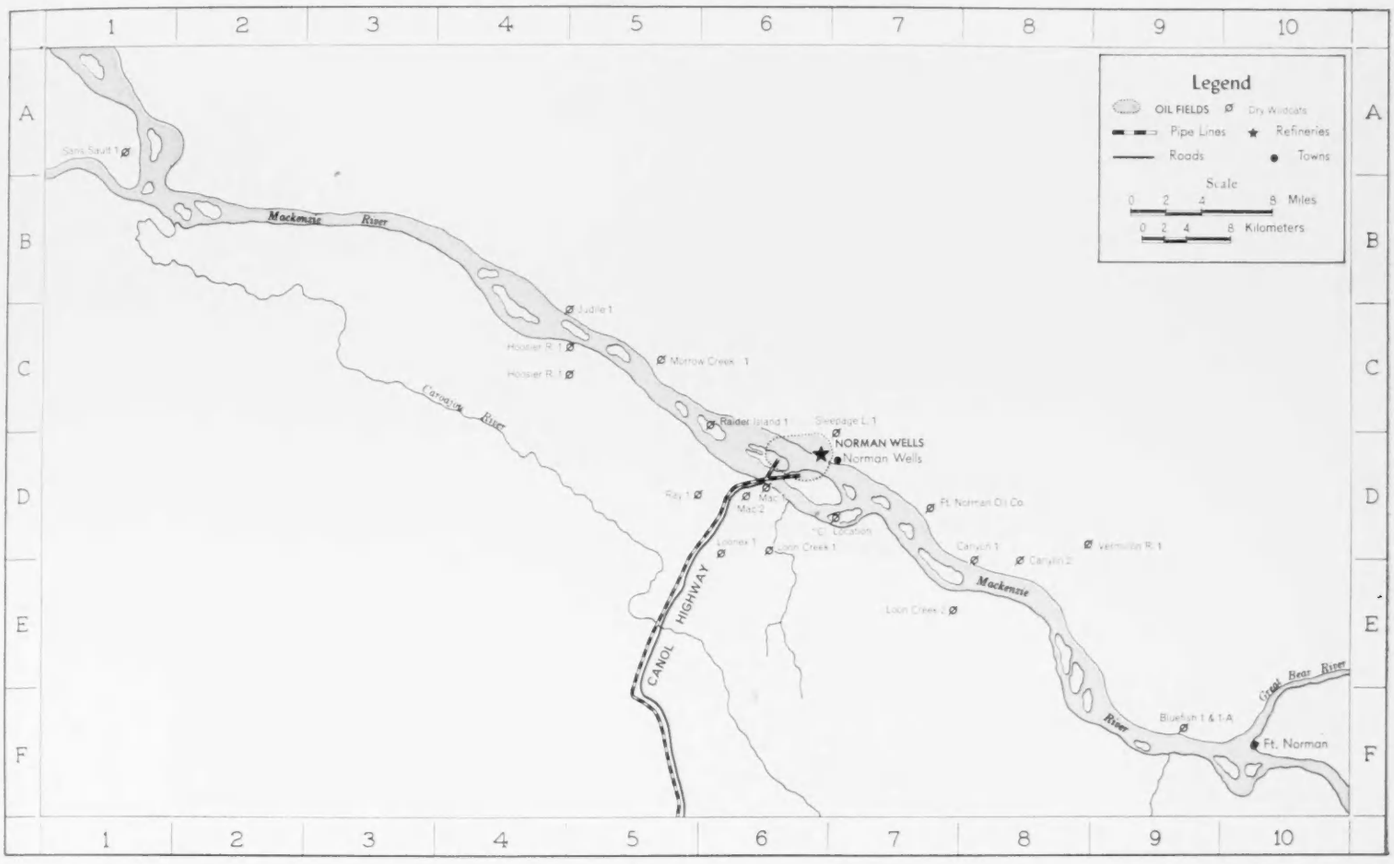
CANADA—Norman Wells



Canada—Continued from page 71

Two wildcat rigs continued active in Nova Scotia province during the year. Sun Oil Company had a rig running near Nappan in Cumberland County. The test was drilling below 8250 feet in sandstones and shales of the Horton formation. During 1945, Sun's Nappan 1 was abandoned at 6499 feet. Nova Scotia Oil & Gas Company, Ltd., had a rig operating near Kennetcook, Hants County. This test bottomed at 897 feet in sandstones and shales of the Horton formation and work was temporarily suspended. In 1945, the same company's Kennetcook 1 was abandoned at 638 feet.

Drilling in Eastern Canada

FIELD and PROVINCE	WELLS COMPLETED IN FIELDS IN 1946				
	Oil	Gas	Dry	Total Wells	Total Footage
Bothwell, Ontario					
*Dawn, Ontario			1	1	600
*Elgin, Ontario		6	7	13	14,006
*Haldimand, Ontario		102	62	164	134,840
*Lincoln, Ontario		11	1	12	5,705
Moore, Ontario			7	7	7,097
Mosa, Ontario	15		1	16	7,403
*Norfolk, Ontario		14	26	40	43,158
Onondaga, Ontario					
Sarnia, Ontario			1	1	490
*Tilbury, Ontario			3	3	5,437
*Welland, Ontario		35	9	44	30,564
*Wentworth, Ontario		4		4	1,765
Warwich, Ontario			3	3	1,450
*Zone, Ontario		8	3	11	17,120
*Chatham, Ontario		2	5	7	15,011
Enniskillen, Ontario	6		14	20	13,214
Other Areas, Ontario	5	23	30	58	82,745
Totals	26	205	173	404	380,065

* Indicates Gas Field.

Drilling in Western Canada

Province, Area, Field	WELLS COMPLETED IN 1946				
	Oil	Gas	Dry	Total Wells	Total Footage
ALBERTA					
Foothills Area					
Jumping Pound		1		1	10,578
Moose Dome		1		1	3,158
Turner Valley	11		2	13	113,810
Wildcats		1	4	5	44,230
Total Area	11	3	6	20	171,776
Southern Plains					
Brooks		1	1	2	6,807
Conrad	1			1	3,026
Del Bonita		1		1	4,965
Medicine Hat		2		2	2,290
Pakowki		4	3	7	16,371
Princess	2		4	6	22,671
Taber	2			2	6,460
Tilley		1		1	1,300
Wildcats		3	13	16	62,363
Total Area	5	12	21	38	126,253
Central Plains					
Elk Point		3	1	4	14,948
Kinsella		18	8	26	57,891
Lloydminster	12	1	2	15	29,273
Provost		5	3	8	24,990
Viking			2	2	6,290
Wildcats	1		12	13	37,313
Total Area	13	27	28	68	170,705
Syncline Area					
Wildcats			2	2	17,923
Total Area			2	2	17,923
SASKATCHEWAN					
Lloydminster-Lone Rock	39		4	43	82,041
Wildcats		2	9	11	34,499
Total Area	39	2	13	54	116,540
Total All Areas	68	44	70	182	603,197

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CANADA—Continued

Natural Gas Output

Natural gas production in Canada totaled 52,314,494,000 cubic feet in 1946. Of this production, 43,815,296,000 cubic feet was produced in Western Canada and 8,499,198,000 cubic feet in Eastern Canada. Output in Alberta province was 43,667,706,000 cubic feet, while Sashkatchewan's production was 147,590,000 cubic feet. In eastern Canada, Ontario province produced 7,959,709,000 cubic feet and 539,489,000 cubic feet was produced in New Brunswick Province.

Crude Oil Prices

The lowering of federal subsidies on oil imports to Canada permitted an increase of 45-cents per barrel in Turner Valley field prices on January 1, 1946. The schedule was $1.97 per barrel for 33-33.9 API gravity crude, with a two-cent per barrel differential upward to a top price of $2.59 per barrel for 64-gravity and above. Removal of subsidies permitted a further advance of 50-cents per barrel on January 15, 1947, raising the prices to $2.47 per barrel for 33-33.9-gravity and making the top price $3.09 per barrel for 64-gravity and above. The Turner Valley boost is reflected in increases in value of other western Canadian crudes.

Bitumen Discovery

A rich deposit of liquid bitumen—estimated at 400 to 500 million barrels—has been uncovered by the Dominion government on the west side of the Mildred-Ruth Lakes area, opposite the mouth of Steepbank River, 20 miles north of Fort McMurray in Northern Alberta Province. The estimate of content per acre ranges as high as 350,000 barrels.

Discovered by the Dominion in the course of its wartime exploration operations in the bituminous sand area of Northern Alberta, the deposit will be turned over to the Abasand Company, under the agreement whereby the government took over wartime operation of this company in an effort to speed commercial development of the tar sands. The deposit, officials believe, is of sufficient size and quality to justify development, but the cost and the markets for the products are factors to be considered.

The deposit is 250 miles northeast of Edmonton, capital of Alberta, and is about 18 miles north of the Waterways terminus of the Northern Alberta Railway.

OIL STATISTICAL SOURCES

Western Canada

Mineral ownership rights: Bulk of oil and gas rights vested in Crown, represented by the provincial governments. However, millions of acres are freehold.

Government Concession bureau: Alberta Department of Lands and Mines, Edmonton; Saskatchewan Department of Natural Resources, Regina; Dominican Department of Mines and Resources, Ottawa (N. W. Territories); Dominion Department of Indian Affairs, Ottawa (Indian Reserves).

Geological maps and data: Dominion Geological Survey, Ottawa; Alberta Petroleum and Natural Gas Conservation Board, Calgary; Daily Oil Bulletin, Calgary.

Production and dry holes maps: Alberta Petroleum and Natural Gas Conservation Board, Calgary; Saskatchewan Department of Natural Resources, Regina; Nickel Map Service, Calgary.

Record of wells drilled: Alberta Petroleum and Natural Gas Conservation Board, Calgary; Dominion Geological Survey, Ottawa; Saskatchewan Department of Natural Resources, Regina.

Well elevations and geological tops: Alberta Petroleum

Natural Gas Pipe Lines of Eastern Canada
(All in Use)

COMPANY	Origin	Terminus	Length (Miles)	Diameter (Inches)	Year Completed
Dominion Natural Gas Co.	Tilbury	Hamilton	175	12, 10, 8	1912
Dominion Natural Gas Co.	Tilbury	Kingsville	30	8	1912
Dominion Natural Gas Co.	Haldimand	Hamilton	(2) 50	10	1910
				8	1906
Union Gas Co. (Canada)	Haldimand	Hamilton	50	8	1936
Union Gas Co. (Canada)	Dawn	London	60	10	1935
Union Gas Co. (Canada)	Tilbury	Windsor	50	(2) 10	1906
					1908
Union Gas Co. (Canada)	Tilbury	Sarnia	55	10	1910

Crude Oil Pipelines of Western Canada

COMPANY	Origin	Terminus	Length (Miles)	Diameter (Inches)	Year Completed	Status
Valley Pipeline Company	Turner Valley	Calgary	30	4	1925	In use
Valley Pipeline Company	Turner Valley	Calgary	30	4	1937	In use
Valley Pipeline Company	Turner Valley	Calgary	31	6	1938	In use
Valley Pipeline Company	Turner Valley	(Gathering lines)	105	2, 3, 4	1945	In use
Standard Development Company	Conrad field	Conrad	5½	4	1945	In use
Standard Development Company	Princess field	Princess	3½	3	1945	In use

Natural Gas Pipelines of Western Canada

COMPANY	Origin	Terminus	Length (Miles)	Diameter (Inches)	Year Completed	Status
Canadian Western Natural Gas, Light, Heat & Power Company	Turner Valley	Calgary	28	10	1922	In use
Canadian Western Natural Gas, Light, Heat & Power Company	Turner Valley	De Winton	16	14	1922	In use
Canadian Western Natural Gas, Light, Heat & Power Company	Turner Valley	Okotoks	15	6	1922	In use
Canadian Western Natural Gas, Light, Heat & Power Company	Foremost	Bow Island	29.5	10	1912	In use
Canadian Western Natural Gas, Light, Heat & Power Company	Bow Island	Calgary	169.5	16	1912	In use
Canadian Western Natural Gas, Light, Heat & Power Company—Branches on Bow Island, Calgary system, served from Turner Valley		Lethbridge	4.1	8	1912	In use
		MacLeod	16.6	6	1915	In use
		Granum	5.5	6	1915	In use
		Claresholm	9.9	6	1920	In use
		Stavely	3.3	3	1915	In use
		Nanton	1.4	4	1915	In use
Northwestern Utilities, Ltd	Viking	Edmonton	77.2	12¾ (Double)	1923	In use
Northwestern Utilities, Ltd	Kinsella	Viking	10	10 & 12	1940	In use
Northwestern Utilities, Ltd., (Branch on Viking-Edmonton system)		Vegreville	20	4	1930	In use
		Ponoka	70	8	1946	In use
	Ponoka	Red Deer	30	6	1946	In use
Franco Utilities, Ltd	Vermilion field	Vermilion	5	4	1943	In use
Wainwright Gas Company	Fabyan	Wainwright	7½	4	1927	In use

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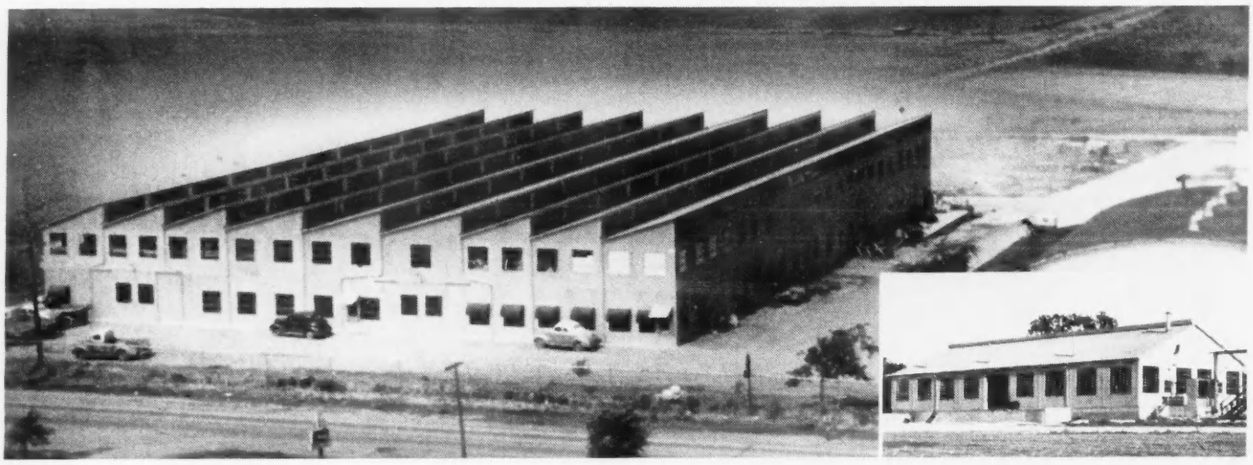

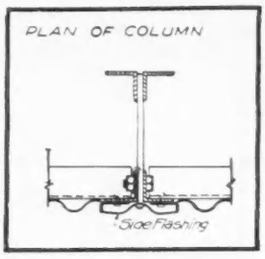

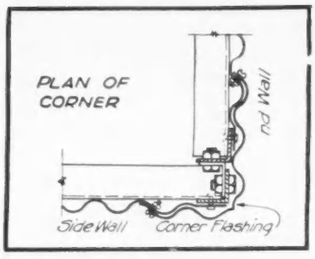

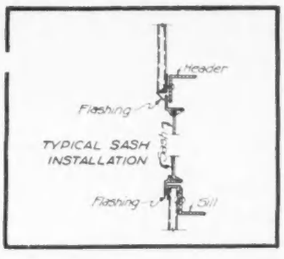

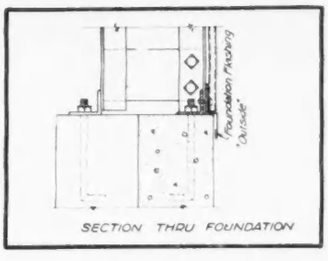

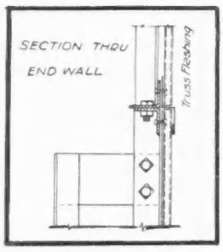

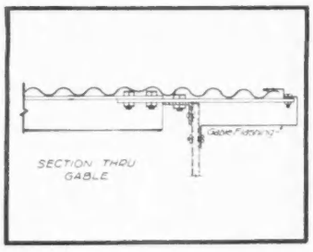

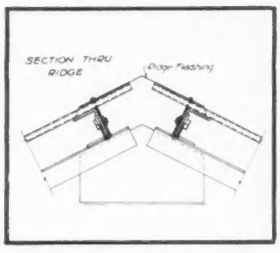

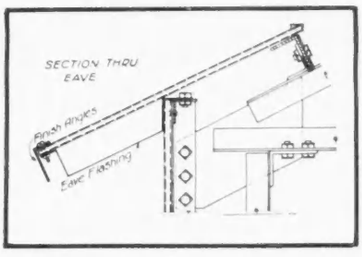

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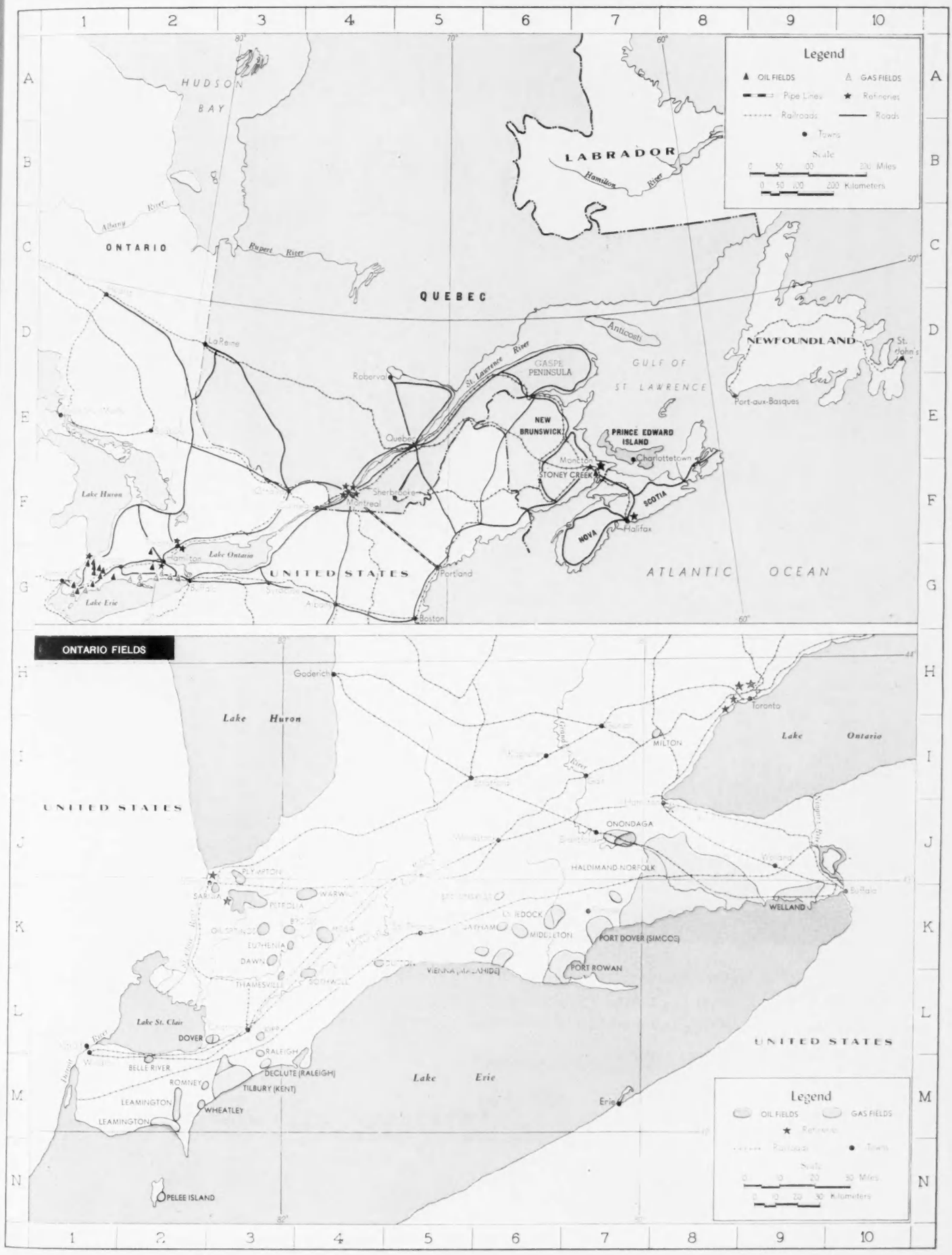

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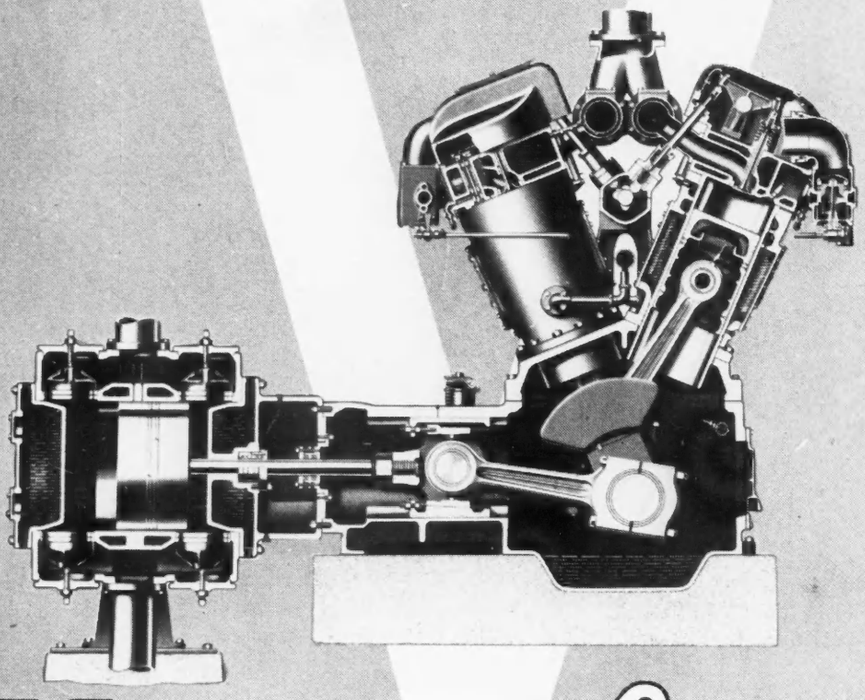

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CANADA—Continued

and Natural Gas Conservation Board, Calgary; Saskatchewan Department of Natural Resources, Regina; Dominion Geological Survey, Ottawa.

Electric logs of wells: No electric log service yet available. In many cases, operators are willing to supply copies or loan copies.

Eastern Canada

Mineral ownership rights: Private land owners.

Geological maps and data: Department of Mines, Toronto; Geological Survey, Ottawa.

Production and dry holes maps: Department of Mines, Toronto.

Records of wells drilled: Department of Mines, Toronto; Geological Survey, Ottawa.

Well elevations and geological tops: Geological Survey, Ottawa.

Electric logs of wells: None available.

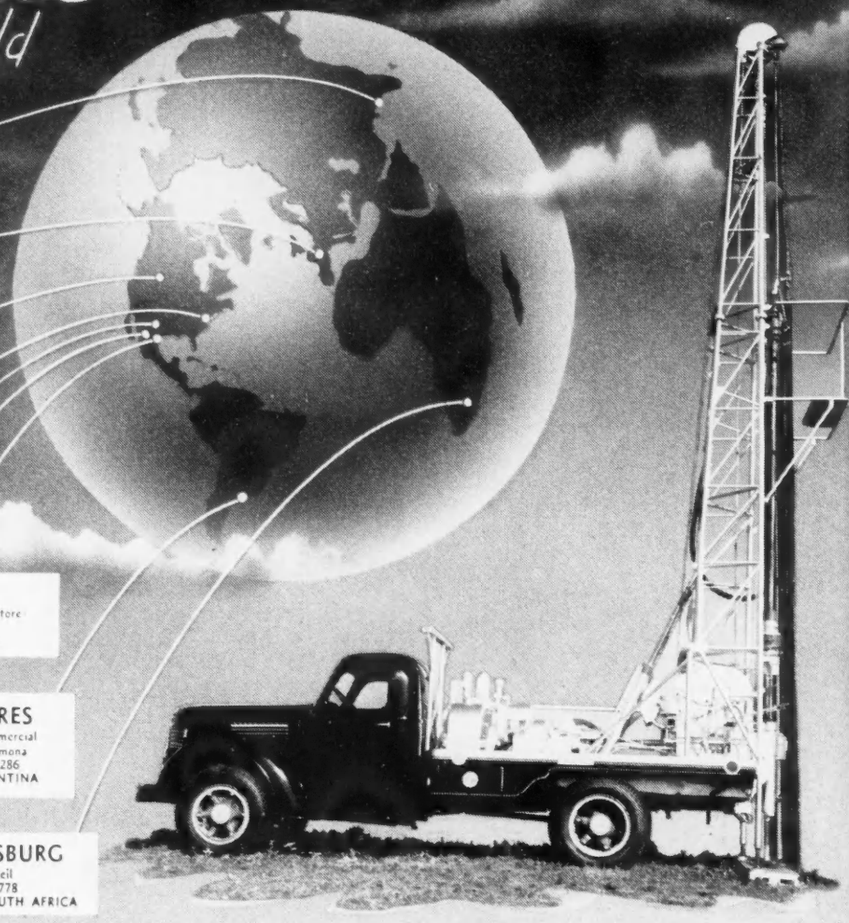
Wildcats Completed in Canada in 1946

PROVINCE	Company and Well	Date Completed	Total Depth (Feet)	RESULTS
Western				
Alberta	Home-Brazeau Syndicate Well No. 1	2-28	11689	Gas discovery in Madison lime topped at 9498 ft.
Alberta	Roxana Oil's Keystone Valley 3	10-20	5560	Abnd. in Lower Benton.
Alberta	Co-op Refineries' Stimson Creek 1	4-14	10923	Abnd. in Madison lime.
Alberta	Imperial & Shell's Stolberg 1	9-13	13747	Abnd. in Banff lime.
Alberta	Phillips' Sullivan Creek 1	5-23	3500	Abnd. in Fernie shale.
Alberta	Alliance Oil Company's Antelope Valley 1	5-27	3943	Testing.
Alberta	California-Standard's Burdett-Province 4	2-25	3209	Abnd. in Madison lime.
Alberta	Sun Oil Co.'s C.P.R. 1	11-22	4894	Abandoned.
Alberta	Empress Utilities 1	7-25	1700	Small gas discovery.
Alberta	California-Standard's Foremost Province 4	1-28	4252	Abnd. in Devonian.
Alberta	Admiral-Superior's Hay Lake 1	9-1	3090	Abandoned.
Alberta	California-Standard's Irvine Province 28-11	4-23	3385	Abnd. in Madison lime.
Alberta	Imperial's Lethbridge 1	1-3	4700	Abnd. in Madison lime.
Alberta	Imperial's Lethbridge 2	5-11	6426	Abnd. in Devonian.
Alberta	McColl-Frontenac & Union Oil's 11B-6-2-8	4-25	3303	Abnd. in Madison lime.
Alberta	McColl-Frentenac & Union Oil's 16D-29-1-9	5-27	3236	Abnd. in Madison lime.
Alberta	McColl-Frontenac & Union Oil's 4-10-1-8	6-29	3537	Abnd. in Madison lime.
Alberta	McColl-Frontenac & Union Oil's 9-A-22-3-8	7-25	2046	Pakowki gas discovery in Bow Island sand.
Alberta	Okalta Oil's Keho 1	8-15	4877	Abnd. in Madison lime.
Alberta	Imperial Stirling 2	6-28	3942	Abnd. in Madison lime.
Alberta	British American-California Standard's 78-23	6-12	4080	Abnd. in Devonian.
Alberta	Imperial's Youngstown 1	10-26	3789	Small gas discovery.
Alberta	Imperial-Anglo Canadian Crossfield 1	3-30	9526	Abandoned.
Alberta	Royalite Oil's De Winton 1	6-16	8397	Abnd. in Madison lime.
Alberta	Baxter Lake Oil's No. 1	7-10	2089	Oil discovery in Wainwright
Alberta	AC-H-CE Beaverhill Lake 1	9-10	3017	Abnd. in Devonian.
Alberta	Shunda Oil's Bruderheim 1	12-15	2325	Abandoned.
Alberta	Imperial's Deville 1	10-31	3636	Abnd. in Devonian.
Alberta	Imperial-AC-H-CE Deville 2	11-11	2620	Abnd. in Cretaceous.
Alberta	Imperial-AC-H-CE deville 3	12-4	2674	Abandoned.
Alberta	Imperial Duvernay 1	6-19	2789	Abnd. in Devonian.
Alberta	Imperial's Duvernay 2	7-10	2969	Abnd. in Devonian.
Alberta	Imperial's Devernay 4	8-9	3400	Abnd. in Devonian.
Alberta	Edgerton Oil's Well No. 4	7-26	2677	Abnd. in Devonian.
Alberta	AC-H-CE Elk Point 1	7-21	3929	Gas and salt discovery.
Alberta	Shell's Fribourg 31-32	8-16	3657	Abnd. in Devonian.
Alberta	AC-H-CE Fort Augustus 1	10-27	3313	Abnd. in Devonian.
Alberta	Imperial's Provost 1	6-8	2549	Oil discovery in Cretaceous. Gas discovery in Viking.
Alberta	Iscris-M 3 (DeKoch)	9-25	2138	Abnd. in Devonian.
Saskatchewan	Imperial's Davidson 1	1-17	5062	Abandoned.
Saskatchewan	Imperial's Davidson 2	4-21	4577	Abandoned.
Saskatchewan	Bata Petroleum's No. 13	5-15	2174	Abnd. in Devonian.
Saskatchewan	Bata Petroleum's No. 14	5-25	2265	Abnd. in Devonian.
Saskatchewan	Bata Petroleum's No. 15	6-30	2081	Gas extension well.
Saskatchewan	Verbata Gas & Oil's 2	6-30	4490	Gas producer in Viking.
Saskatchewan	Cypress-Fox Valley 1	6-15	3241	Abandoned.
Saskatchewan	Bata-Provost 1	8-4	3161	Abandoned.
Saskatchewan	Community Service's Battleford 1	9-15	2379	Abandoned.
Saskatchewan	Community Service's Watrous 1	7-15	3868	Abandoned.
Saskatchewan	Torch River Syndicate's White Fox 1	4-15	1201	Abandoned.
Eastern:				
Nova Scotia	Sun Oil's Well No. 2		8200	Drilling in Horton formation.
Nova Scotia	Nova Scotia Oil & Gas' Well No. 2		897	Temporarily suspended.

Data on Refineries in Canada

COMPANY	Location of Plant	Total Crude Charging Capacity, (Bbls. Daily)	Cracking Capacity, (Bbls. Daily)	Type of Refinery	Operating Status
WESTERN CANADA					
Alberta:					
British-American Oil Co., Ltd.	Calgary	5,500	2,500	S-C-A	Operating
Excelsior Ref., Ltd.	Lloydminster	1,000	.....	Skimming	Operating
Gold Standard Oils, Ltd.	Wainwright	300	.....	Skimming	Operating
Houky Refining Co.	Lloydminster	2,500	.....	Asphalt	Building
Imperial Oils, Ltd.	Calgary	8,300	4,000	S-C-A	Operating
Pacific O&R of Alberta	Lethbridge	2,000	.....	Skimming	Shut Down
Turner Valley Gas & Oil Refineries, Ltd.	Hartwell (Turner Valley)	2,200	1,000	Skim-Crk	Operating
British Columbia:					
Home Oil Distributors, Ltd.	N. Vancouver	2,000	.....	Skimming	Shut Down
Imperial Oils, Ltd.	Ioco (Vancouver)	16,000	2,600	Complete	Operating
Shell Oil Co. of B. C.	Shelburn (Vancouver)	4,200	.....	Skimming	Operating
Standard Oil Co. of B. C.	Burnaby (Vancouver)	4,700	.....	Skim-Asphalt	Operating
Manitoba:					
Anglo-Canadian Oils, Ltd.	Brandon	2,000	1,000	Skim-Crk	Operating
North Star Oil, Ltd.	St. Bonaface	2,000	750	S-C-A	Operating
Radio Oil Refining, Ltd.	Winnipeg	500	.....	Skimming	Operating
Trump Oil Co., Ltd.	Morris	250	.....	Skimming	Operating
Northwest Territory:					
Northwest Co., Ltd.	Norman Wells	850	.....	Skimming	Operating
Saskatchewan:					
British-American Oil Co., Ltd.	Moose Jaw	5,200	2,500	S-C-A	Operating
Consumers Co-op. Refin.	Regina	1,500	500	Skim-Crk	Operating
HiWay Refineries, Ltd.	Moose Jaw	300	.....	Skimming	Operating
HiWay Refineries, Ltd.	Rosetown	275	.....	Skimming	Operating
HiWay Refineries, Ltd.	Saskatoon	300	.....	Skimming	Operating
Imperial Oil, Ltd.	Regina	10,500	6,500	S-C-A	Operating
Northern Petroleum Corp.	Kamsack	200	.....	Skimming	Operating
Sterling Refineries, Ltd.	Yorkton	750	.....	Skimming	Shut Down
Yukon:					
U. S. Army	Whitehorse	4,000	.....	Complete	Shut Down
Total Western Canada	25 Plants	77,325	21,350		
EASTERN CANADA					
New Brunswick:					
New Brunswick G & O. Flds., Ltd.	Weldon	250	.....	Skimming	Operating
Nova Scotia:					
Imperial Oil, Ltd.	Dartmouth	34,000	11,600	S-C-A	Operating
Ontario:					
British-American Oil Co., Ltd.	Clarkson (Toronto)	8,250	4,500	Complete	Operating
Burlington Refineries, Ltd.	Hamilton	600		Skimming	Operating
Canadian Oil Companies, Ltd.	Petrolia	3,500	1,500	S-C-L-W	Operating
Good Rich Refining Co., Ltd.	Port Credit (Toronto)	4,000	1,300	Skim-Crk	Operating
Imperial Oil, Ltd.	Sarnia	41,500	20,000	Complete	Operating
McColl-Frontenac Oil Co., Ltd.	Toronto	13,000	3,300	Skim-Crk	Operating
Quebec:					
British-American Oil Co., Ltd.	Montreal	17,000	7,500	S-C-A	Operating
General Petroleum Refineries	Pointe-aux Trembles (Montreal)	300		Skimming	Shut Down
Imperail Oil, Ltd.	Montreal	25,000	9,800	S-C-L-A	Operating
McCoul-Frontenac Oil Co., Ltd.	Montreal	20,000	12,500	Skim-Crk	Operating
Shell Oil Co. of Canada, Ltd.	Montreal	10,000	7,500	Skim-Crk	Operating
Total Eastern Canada	13 Plants	177,400	79,500		
Total All Canada	38 Plants	254,725	100,850		

Sales-Service around the world



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The Holemaster 2500

For 6¼" holes to 2500 feet with 2⅞" drill pipe
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For 5" holes to 4000 feet with 2⅜" drill pipe

*NO 750 DELIVERIES BEFORE JULY 1

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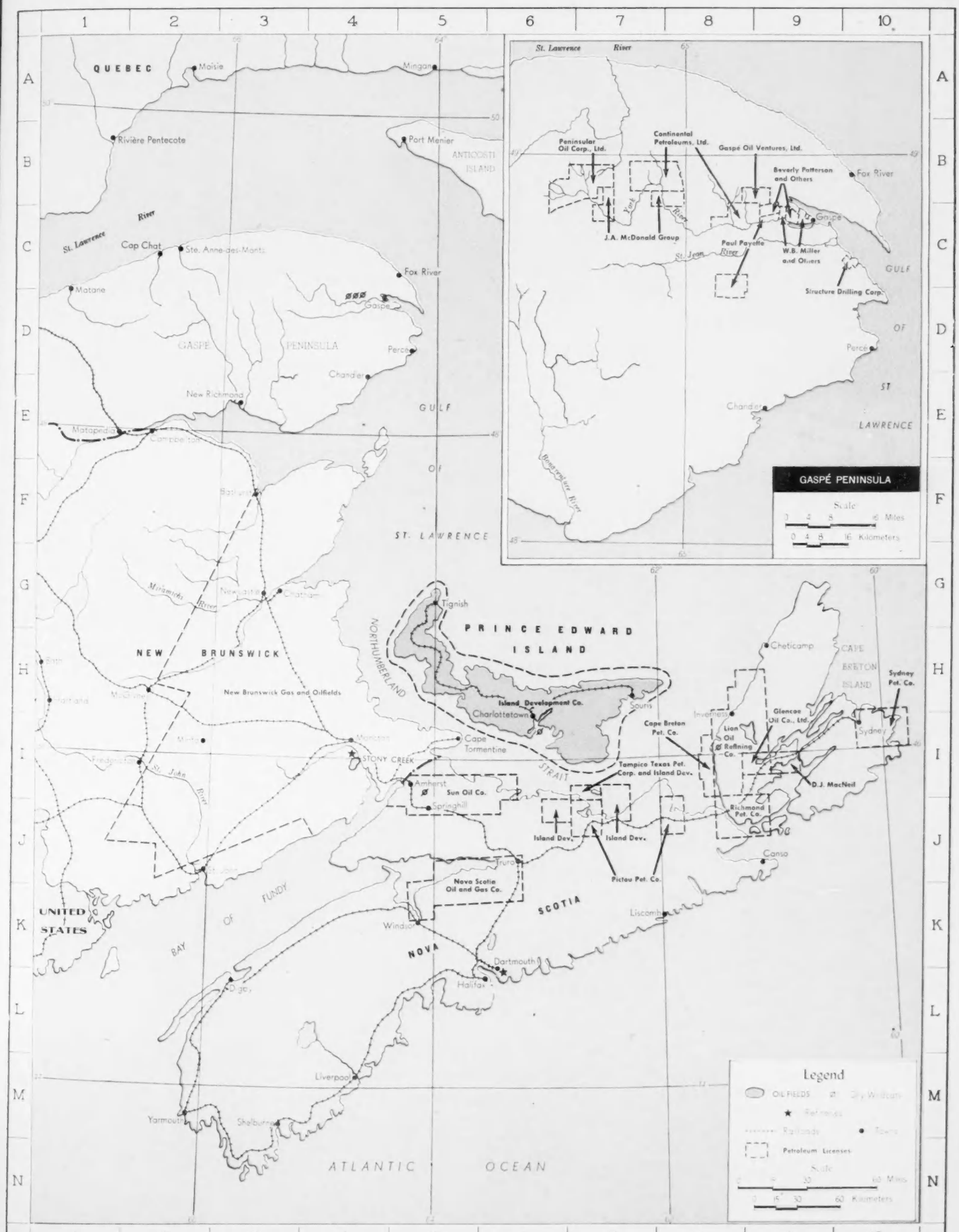

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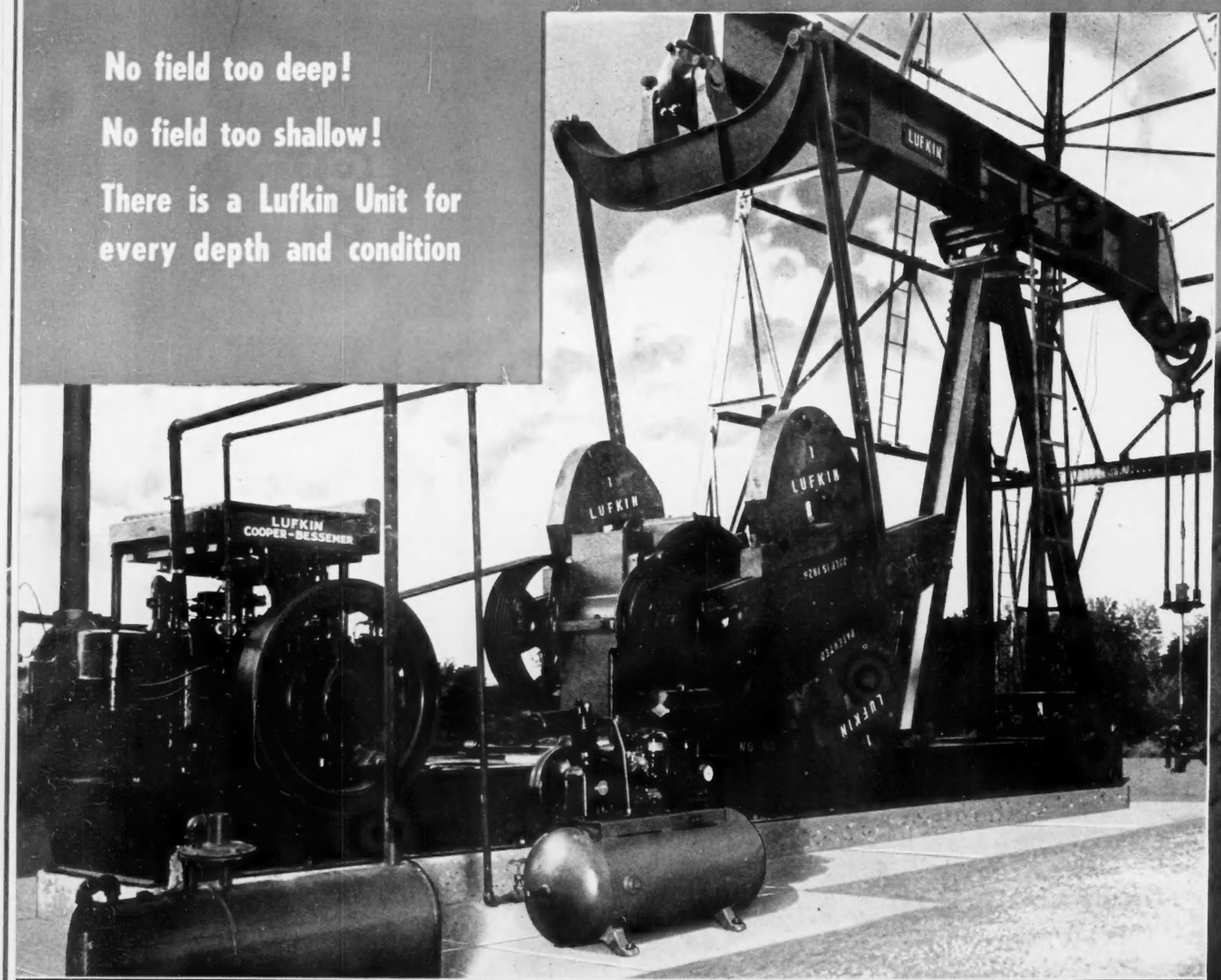

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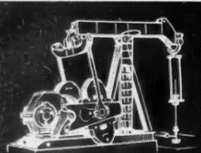
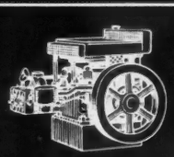


LUFKIN
PUMPING UNITS



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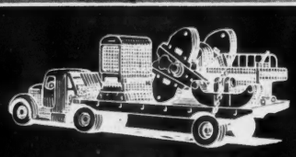

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TAMAULIPAS
Ciudad Victoria
Tropic of Cancer
Zacatecas
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Tampico
TUXPAN PANUCO FIELDS
San Luis Potosi
NAYARIT
Aguascalientes
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SAN PEDRO
MAGUEY
GUANAJUATO
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MEXICO

MEXICO'S petroleum industry, presently being pushed to meet unprecedented demand, boosted its oil production during 1946 to 49,235,421 barrels. This represents a 13 percent rise over the 43,547,360 barrels produced in 1945.

At the end of 1946 Mexico's oil fields were producing at the rate of about 133,000 barrels daily with the Poza Rica field accounting for 78,000 barrels of this daily output.

A stepped-up export program as well as an increase in domestic consumption is creating the pressure on the Mexican oil industry for increased production. During the first 10 months of 1946, Mexico's export of all oils totaled slightly more than 8 million barrels and indicated a total of 9,400,000 barrels of crude oil would be exported during the entire year. This compares with 7,900,000 barrels exported during 1945.

The Poza Rica field carried the weight of the increased output during 1946 by producing a total of 26,217,201 barrels as compared with approximately 23 million barrels in 1945. Untried as yet in the sense that it has never been pushed to capacity, Poza Rica has gradually increased from about 57,000 barrels daily in 1944 to its present production of about 78,000 barrels. The field has produced for short periods at rates of almost 100,000 barrels daily but its real capacity has never been definitely fixed. With continued rise in demand, the Poza Rica field likely will be called on to furnish the increased production.

Production in the Northern District of Tampico, which includes the old Panuco heavy crude field, totaled 8,652,580 barrels during 1946 as compared with 5,294,336 barrels in 1945. At the end of 1946, the daily output of this district was about 15,284 barrels.

Output in the Golden Lane sector of Mexico declined during 1946 to 8,500,633 barrels as against 10,041,266 barrels in 1945.

Isthmus of Tehuantepec production has been boosted to about 17,000 barrels daily and during 1946 the output was 5,842,036 barrels as compared with 5,241,740 barrels in 1945.

With new oil fields needed to implement present production, Pemex is launching an extensive wildcat drilling program and many tests will be drilled in 1947. Pemex, not having sufficient equipment of its own to carry out the full program, is negotiating with American contractors to drill a number of these tests—and some contracts already have been signed. Principal areas explored by Pemex geologists and considered ready for drilling are in the states of Vera Cruz, Tabasco and Chiapas in the Isthmus area; Tamaulipas, just south of the Texas border; Chihuahua; mid-western side of Baha, California, and western Sinaloa.

Drilling of both field wells and wildcat tests in Mexico during 1946 was on par with the drilling in 1945. During the year 37 field wells and 12 wildcat tests were completed with total footage being 261,253 feet. This compares with 43 field wells and 6 wildcat tests in 1945 when total footage drilled was 227,729 feet.

Of the field wells drilled, 25 were completed as oil producers and two as gas wells. In 1945, 28 oil wells and 3 gas wells were completed.

The wildcat drilling program apparently has succeeded in opening a new field about 15½ miles west of famed "Potrero del Llano," one of the high spots on Mexico's billion-barrel Golden Lane.

The wildcat—Pemex' Tlacolula 7—was bottomed at last report at 7503 feet with a good show of oil and gas at that level. Production string has been set and testing is under way. On a drill stem test, the well made 42-gravity oil.

Most of the wildcat drilling in 1946 was in the state of Vera Cruz where eight tests were completed as dry holes during the year. Unsuccessful tests were also drilled in Tabasco, Neuvo Leon and San Luis Potosi. Field well drilling was mostly confined to the Poza Rica and El Plan fields.

The Mission gas field, located near Reynosa on the Texas border, now has four producers, all shutin. During 1946 two wells were completed.

The Soledad field, discovered in 1945, apparently has been disappointing with the second well yielding salt water.

At the end of 1946, Mexico had 953 producing wells of which 768 are flowing oil wells and 185 are on artificial lift. Shutin wells total 318.

In the northeastern area, 15 gas wells are flowing and during 1946 yielded a production of 2058 million cubic feet of gas.

New Administration

Under its nationalization program, Mexico's petroleum industry is operated by Petroleos Mexicanos, the government

Engineering and Geological Data on Mexico's Oil Fields

FIELD AND STATE	Proved Area (Acres)	Range of Gravity of Oil (API)	PRODUCING FORMATION			Depth of Wells (Feet)		Average Thickness Pay (Ft.)	Type Structure
			Name	Kind	Age	Minimum Top Pay	Maximum Total Depth		
NORTHEASTERN MEXICO:									
La Presa, **Tamaulipas**		gas	Mt. Selman	Sand	Eocene	1925	3160	38	Anticline
Mier, **Tamaulipas**		gas	Mt. Selman	Sand	Eocene	2120	2345		Nose
Mision, **Tamaulipas**		dist.	Vicksburg	Sand	Lwr. Olig.		6040		Anticline
Rancherias, **Tamaulipas**	1230	gas	(Fayette Yegua Cook Mt	Sand	Eocene	264	2440	310	Anticline
TAMPICO AREA:									
Poza Rica, **Vera Cruz**	15,850	30	Tamabra	Lime	Lwr. Cre	7250	7546	296	Nose
Northern District, **Ver.-Tamps.** (Ebano, Panuco, etc.)	100,000	12	Tamaulipas	Lime fractures	Lwr. Cre	1148	1968	*	Faulted Ant.
Southern District, **Vera Cruz,** (Golden Lane)	33,000	20	El Abra	Lime reef	Lwr. Cre	2200	2202	†	Faulted Ant.
Soledad, **Vera Cruz**		40	Tamabra	Lime	Lwr. Cre	6435	6480	10	Nose
ISTHMUS OF TEHUANTEPEC:									
Cuichapa, **Vera Cruz**	300	30	Concepcion Inferior	Sand	Miocene	2100	2133	33	Faulted dome
El Burro, **Vera Cruz**	370	26	Concep. Inf.; Encanto	Sands	Miocene	2460	2620	62	Salt dome
El Plan, Lignitic Zone, **Vera Cruz**	830	24	Cedral, Lignitic	Sands	Miocene	1970	2440	216	Faulted Ant.
El Plan, Concepcion, **Vera Cruz**	250	30	Concep. Inf.; Sup.	Sands	Miocene	5734	5865	131	Dome
El Plan, East Extension, **Vera Cruz**	80	35	Concep. Inf.; Encantc.	Sands	Miocene	3883	4110	32	Faulted nose
Filisola, **Vera Cruz**	460	22	Encanto	Sand	Miocene	1585	1980	92	Fltd. terrace
Nuevo Teapa, **Vera Cruz**	40	36	Encanto	Sand	Miocene	429	711	29	Salt dome
Tonala, **Vera Cruz**	470	28	Concep. Inf.; Encanto Deposito	Sands Sand	Miocene Oligocene	1640	2130	167	Salt dome

* Prod. from fractures in first 800 feet of Tamaulipas and San Felipe limes. † Wells go into reef-phase limestone only about 2 feet.

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3/4 Ton
Weight 14 lbs.

Model F-T-G
Convertible
1 Chain 1½ Tons,
112" Lift
2 Chains 3 Tons,
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Raising and lowering suction hose (two are needed with each rig).

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PIPE LINE DEPARTMENT:

Raising, lowering, and installing pipe lines.
Bending pipe.
Load binders for binding loads of pipe and all kinds of machinery and equipment.

SIGNAL DEPARTMENT:

Pulling up guy wires, messenger wires, and underground cables.

SUPPLY YARDS:

Load binders for binding all type loads.

COMPANY GARAGES:

Pulling motors.
Straightening frames.
General maintenance work of all types.

WAREHOUSES:

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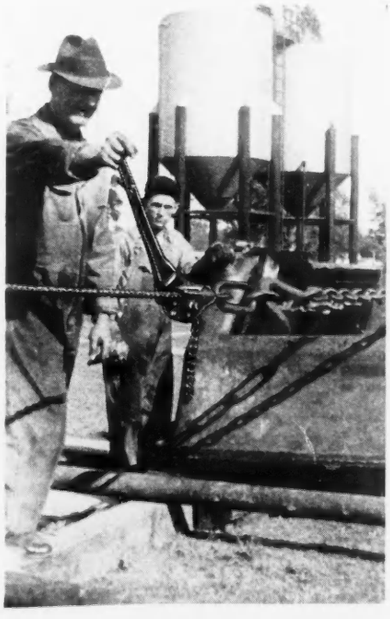
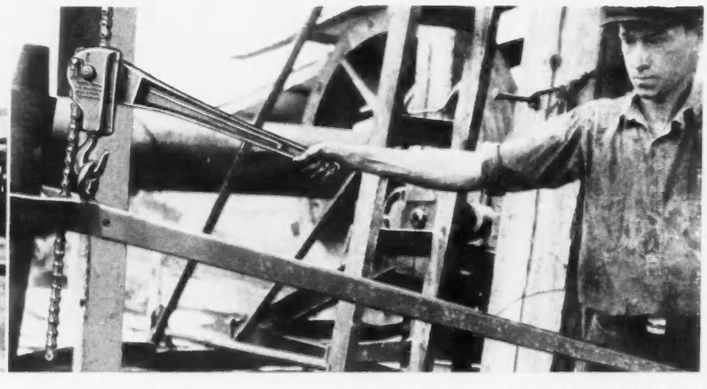




MEXICO—Vera Cruz Panuco Fields

BILL

(Superintendent)

JOE

(Toolpusher)

BILL—"Say, Joe—how come you took up so much time getting that inclination survey on N.C.B No. 7? Appears to me as tho your drilling crews must have gone on strike."

JOE—"Gosh, Bill, that record came up with a result that just couldn't possibly be right—that is if I know anything about drilling. If that hole had been that much off we'd never gotten the bit out."

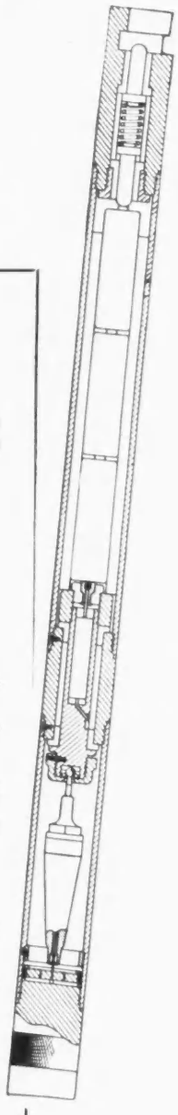
BILL—"Well, that's what you get for using one of those mechanically operated survey instruments."

JOE—"How come?"

BILL—"Because in mechanically operated instruments, you are liable to make a record **before** the plumb bob comes to a standstill. Way off the line!
"Why don't you get wise to the E-C Inclinometer. It records automatically and you can't get a record unless the plumb bob is standing still. So—there's no uncertainty—no new runs necessary—no time lost. That's why operators everywhere are turning to the E-C."

6 WAYS OF USING THE E-C

1. **On Measuring Line.**
2. **On Sand Line.**
3. **As a Go-Devil and recovered when changing bit.**
4. **As a Go-Devil and picked up with a core-barrel overshot.**
5. **Run in with a core-barrel overshot when picking up a core.**
6. **Run inside of bailer in cable tool drilling.**



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MEXICO—Continued

oil company. In 1946, Miguel Aleman was inaugurated as Mexico's president and appointed Antonio J. Bermudez as new director of Pemex.

Bermudez has set up a program calling for a wide-spread wildcat drilling program in hopes that new fields may be found to supplement present production. Interest also has been shown in the oil possibilities along Mexico's continental shelf and plans are taking shape regarding a complete survey of the prospective areas with an eye for future development. The areas where surveys probably will be made are Mexico's shelf along the Gulf of Mexico and along the Gulf of Tehuantepec which extends into the Pacific Ocean.

The new director of Pemex has declared that the question of the entrance of foreign capital into Mexico's oil industry was entirely a matter of government policy and completely out of the province of Pemex.

Meanwhile, the first contract made by the Mexican government with private capital for the exploration and exploitation of oil in Mexico since the famous "expropriation" in 1938 was signed in November of 1946 with Hilario Millan, Jr. The contract covers the prospecting in the state of Sinaloa, on the west coast of Mexico. The concession consists of

Wells and Production in Mexican Gas Fields

AREA, FIELD, STATE	Year of Discovery	Gas Wells at End of 1946 Producing		Gas Production (MCF)	
		Flowing	Total Producing	Year 1946	Cumulative Through 1946
NORTHEASTERN AREA:					
La Presa, Tamaulipas	1931	1	1	134,000	1,501,500
Mier, Tamaulipas	1936	7	7	980,000	16,163,000
Mision, Tamaulipas	1945	1	1	877,000	1,150,000
Rancherias, Tamaulipas	1933	6	6	67,000	13,340,000
Total		15	15	2,058,000	32,154,500

Wildcats Completed in Mexico in 1946

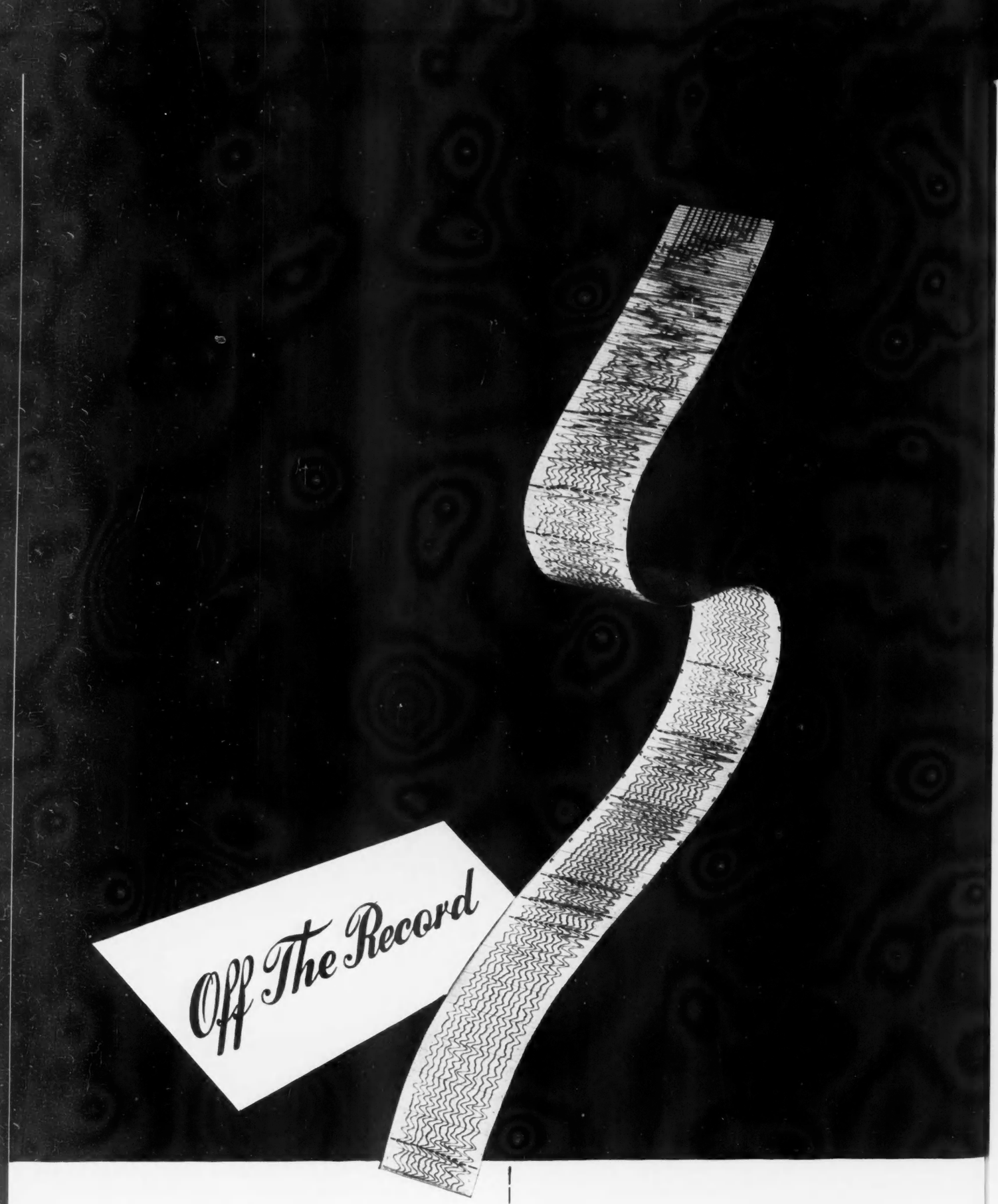
STATE	Company and Well	Date Completed	Total Depth (Feet)	RESULTS
Nuevo Leon	Pemex Norias 1	11–27	5265	Abandoned in Tertiary
San Luis Potosi	Pemex Limon 114	11–11	3125	Abandoned
San Luis Potosi	Pemex Limon 115	11–18	2981	Abandoned
Vera Cruz	Pemex Asuncion 3	2–12	3435	Abandoned, salt water
Vera Cruz	Pemex Tumbadero 5	4–22	2936	Abandoned, salt water
Vera Cruz	Pemex Castillo 3	1– 8	7796	Abandoned
Vera Cruz	Pemex Castillo 4		7169	Abandoned
Vera Cruz	Pemex Tepezintla 1	9–30	6217	Abandoned, salt water
Vera Cruz	Pemex Soledad 2	1–31	6979	Abandoned, salt water
Vera Cruz	Pemex Tecuamapilla 1	4–13	3086	Abandoned
Vera Cruz	Pemex Cabritos 1	10– 9	1357	Abandoned
Tabasco	Pemex La Venta 8	7–10	5305	Abandoned

Oil Wells and Crude Oil Production of Mexico

AREA, FIELD, STATE	Year of Discovery	OIL WELLS AT END OF 1946				CRUDE OIL PRODUCTION (Barrels)			
		Shut in	Producing			Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
			Flowing	Art. Lift	Total Producing				
TAMPICO AREA:									
Poza Rica, Vera Cruz	1930	12	59		59	78,645	22,949,047	26,217,201	261,877,578
Northern District, Vera Cruz, Tamaulipas, San Luis Potosi, (Ebano, Panuco, etc.)	1904	184	475		475	15,284	5,294,336	8,652,580	781,136,341
Southern District, Vera Cruz, (Golden Lane)	1908	49	190		190	22,249	10,041,266	8,500,633	1,069,503,242
Other Fields, Vera Cruz (San Sebastian, Tanhuijo, etc.)		8	9		9		20,971	22,971	4,126,791
Total Tampico Area		253	733		733	116,178	38,305,620	43,393,385	2,116,613,952
ISTHMUS AREA:									
Cuichapa, Vera Cruz	1934						350,303	458,202	1,698,375
El Plan, Vera Cruz	1931						3,080,628	3,787,453	57,365,112
Filisola, Vera Cruz	1921	65	35	185	220	17,234	310,582	247,429	20,771,475
Teapa Nuevo, Vera Cruz	1928								202,596
Tonala and El Burro, Vera Cruz	1928						1,500,227	1,348,952	60,591,270
Other Fields, Vera Cruz									377,197
Total Isthmus Area		65	35	185	220	17,234	5,241,740	5,842,036	141,006,025
Total, All Areas		318	768	185	953	133,412	43,547,360	49,235,421	2,257,619,977

Drilling in Mexico

AREA, FIELD, STATE	WELLS COMPLETED IN 1945					WELLS COMPLETED IN 1946					FIELD WELLS DRILLING AND SHUT DOWN AT END OF 1946		
	Oil	Gas	Dry	Total Wells	Total Footage	Oil	Gas	Dry	Total Wells	Total Footage	Dr	SD	Total
NORTHEASTERN AREA:													
La Presa, Tamaulipas	0	0	0	0	0	0	0	0	0	0	0	0	0
Mier, Tamaulipas	0	1	0	1	5,280	0	0	0	0	0	0	0	0
Mision, Tamaulipas	0	2	0	2	12,140	0	2	0	2	13,910	1	0	1
Rancherias, Tamaulipas	0	0	0	0	0	0	0	0	0	0		1	1
TAMPICO AREA:													
Poza Rica, Vera Cruz	9	0	0	9	67,043	12	0	0	12	89,794	1	5	6
Northern District, Vera Cruz, (Ebano, Panuco, etc.)	5	0	11	16	32,481	0	0	4	4	7,525	0	0	0
Southern District, Vera Cruz, (Golden Lane)	0	0	0	0	0	0	0	0	0	0	0	0	0
Wildcats, Vera Cruz	1	0	3	4	23,472	0	0	8	8	37,975	0	0	0
ISTHMUS AREA:													
Cuichapa, Vera Cruz	4	0	0	4	9,150	1	0	3	4	8,879	0	0	0
El Plan, Vera Cruz	9	0	2	11	68,298	12	0	3	15	86,474	3	0	3
Filisola, Vera Cruz	0	0	0	0	0	0	0	0	0	0	0	0	0
Teapa Nuevo, Vera Cruz	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonala, Vera Cruz	0	0	0	0	0	0	0	0	0	0	0	0	0
Wildcats, Vera Cruz	0	0	0	0	0	0	0	0	0	0	0	0	0
SOUTHERN AREA:													
Wildcats, Tabasco	0	0	2	2	9,865	0	0	1	1	5,305	0	0	0
NEUVO LEON AREA:													
Wildcats, Neuvo Leon	0	0	0	0	0	0	0	1	1	5,285	0	0	0
SAN LUIS POTOSI AREA:													
Wildcats, San Luis Potosi	0	0	0	0	0	0	0	2	2	6,106	0	0	0
Total	28	3	18	49	227,729	25	2	22	49	261,253	5	6	11



Off the record *can* come misinterpretations that *may* lead to costly and unsuccessful leasing and drilling, or, perhaps, the condemnation of productive acreage.

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about 74,130 acres and three wells will be drilled during the first three years of the 30-year grant.

Refineries and Pipe Lines

Mexico presently has 10 refineries operating with a total daily capacity of 172,580 barrels. During 1946, Petroleos Mexicanos placed into operation its modern plant at Atzcapotzalco, suburb of Mexico City. This plant has a daily capacity of 50,000 barrels and will make available a substantial supply of high octane gasoline and other quality products which formerly were scarce in Mexico.

In connection with this refinery, the pipe line bringing crude oil from Poza Rica and the Tampico district has been boosted to 50,000 barrels daily from its former capacity of 22,500 barrels daily.

Under consideration is the construction of a 30,000-barrel daily capacity plant at Salamanca.

A new absorption type natural gasoline plant and a crude oil stabilization plant have been installed in the Poza Rica field. Other new projects include the construction of a desulphurization plant at Poza Rica to treat some 70 million cubic feet of gas per day and a gas pipe line from the field to Mexico City. At Mexico City, the gas will be brought into a plant for the manufacture of fertilizer and after removal of these components, the gas will be available to industry pipe lines and to home users by supplying compressed gas in cylinders.

The natural gas line from the Roma, in northern Mexico, to Monterrey has been boosted to 50 million cubic feet daily.

Pemex is expected to commence construction this year of a new 30,000-barrel-daily refinery at Salamanca, State of Guanajuato. Operating on crude oil from the fields near Vera Cruz, the plant will produce motor gasoline, kerosine, diesel oil, gas oil, fuel oil and liquefied gas. A 12-inch pipe line will be constructed from Poza Rica to Salamanca to serve the new refinery.

1947 Activities

Mexican exports of crude and products during January, 1947, amounted to 1,036,894 barrels and if continued at this rate throughout the year the exports for 1947 would total nearly 12.5 million barrels. This would represent an increase of about 32 percent over the 9,406,362 barrels exported in 1946.

The bulk of Mexico's exported petroleum goes to the United States. During January, 1947, 765,897 barrels of petroleum were shipped to the United States, or about 70 percent of the total exported. Other shipments were made to Belguim, Cuba, France and Italy.

Petroleum exported included heavy and light crude, fuel oil and gas oil, with a majority of the shipments being heavy crude and fuel oil.

In February, 1947, there were 19 rigs active in Mexico with seven being located on wildcat sites. Two rigs were active in the Tamaulipas district. Trevino 1, a Pemex wildcat test near Reynosa was bottomed at 7394 feet and operator was preparing to sidetrack. Mision 8, in the Mision gas field, near Reynosa, was spudding. Ohio Mex Oil Corporation's Rancherias 9, wildcat test near Camargo, Tamaulipas, was still shut down at 1215 feet.

In the Northern district, Pemex' Limon 118 was completed in February at 2142 feet for an estimated 200 barrels daily but this well is located about 6½ miles from the nearest gathering lines and probably will be shutin until further development. The Limon 113 was drilling below 1911 feet.

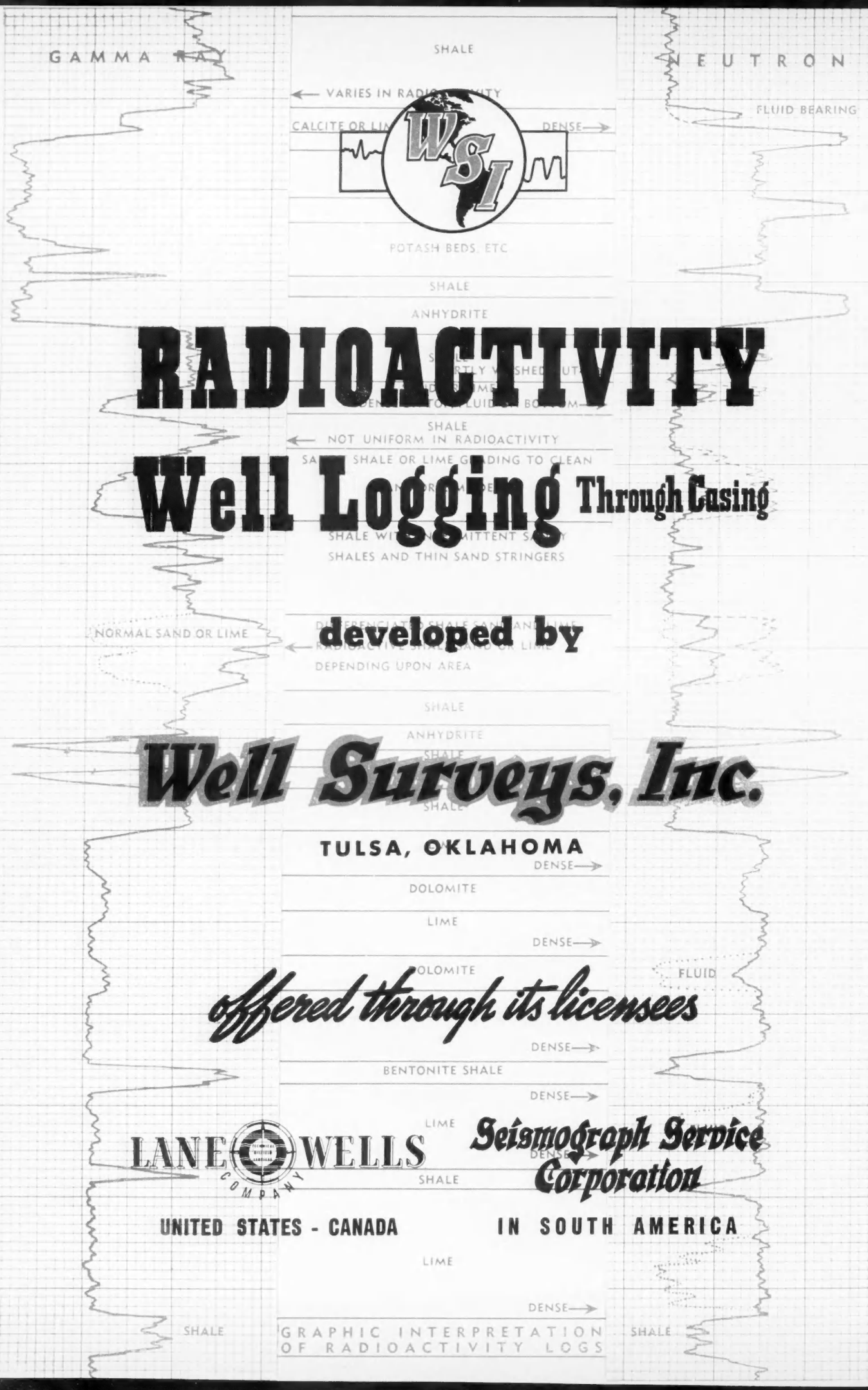
Seven rigs were active in the Poza Rica area while the same number of rigs were running in the Isthmus of Tehuantepec region.

Data on Mexico Refineries

District and Company	Location of Plant	Crude Charging Capacity (Barrels Daily)	Cracking Capacity (Barrels Daily)	Type of Refinery	Operating Status
Northern Mexico					
Pemex	Nuevo Laredo	330	None	Skim.	Operating
Pemex	Nuevo Laredo	190	None	Skim.	Operating
Pemex	Monterrey	160	None	Skim.	Operating
Pemex	Ciudad Juarez	1,000	None	Skim.	Operating
Tampico					
Pemex	Ciudad Madero	55,000	8,500	Complete	Operating
Pemex	Arbol Grande	20,500	None	S-L-W-A	Operating
Pemex	Mata Redonda	11,500	5,500	Skim-Crk.	Operating
Pemex	Bella Vista			Skim-Crk.	Dismantled
Poza Rica					
Pemex	Poza Rica	6,400	None	Skim.	Operating
Central Mexico					
Pemex	Atzcapotzalco (Mexico City)	50,000	None	Complete	Operating
Guanajuato					
Pemex	Salamanca	30,000	None	Skim.	Planned
Isthmus					
Pemex	Minatitlan	27,500	2,500	Complete	Operating
Total Operating	10 Plants	172,580	16,500		

Pipe Lines of Mexico

COMPANY	Origin	Terminus	Length (Miles)	Number of Lines, Pipe Sizes and Loops	Capacity	Status
CRUDE LINES						
Petroleos Mexicanos	Ebano-Panuco Fields	Tampico	35	Combination 8" & 10" with 22 miles of 10" loop	30,000	In Use
Petroleos Mexicanos	Ebano-Panuco Fields	Gathering and branch lines to main trunk line	144	4", 6", 8" & 10"		
Petroleos Mexicanos	Poza Rica	Mexico City	147	One 10"	50,000	In Use
Petroleos Mexicanos	Poza Rica	Tuxpan	39	One 6", one 8" and one 12" with 12 miles of loop	125,000	In Use
Petroleos Mexicanos	Tuxpan	Potrero	33	Two 8"	50,000	In Use
Petroleos Mexicanos	Cobos (Tuxpan)	Alamo	20	One 8"	25,000	In Use
Petroleos Mexicanos	Alamo	Tampico	103	Combination 8" & 10" with 11 miles of loop	24,000	In Use
Petroleos Mexicanos	Poza Rico	Alamo	35	One 12"	63,000	In Use
Petroleos Mexicanos	Alamo	Potrero	14	One 8" & one 10"	75,000	In Use
Petroleos Mexicanos	Potrero	Chijol (Tampico)	87	Three 8"	72,000	In Use
Petroleos Mexicanos	Tonala Field	Minatitlan Refy	35	Combination 8", 10" & 12"		
Petroleos Mexicanos	El Plan Field	El Chapo Station	21	Combination 8", 10" & 12"		
Petroleos Mexicanos	El Chapo Station	Nanchital	6	One 10"	30,000	In Use
Petroleos Mexicanos	Cuichapa	El Plan-El Chapo	3	One 8"		
PRODUCTS LINES:						
Petroleos Mexicanos	Tonala	Nanchital	23	3"		In Use
NATURAL GAS LINES:						
Compania Mexicana de Gas, S.A.	Roma	Monterrey	96	12"	50 Mil. Cu. Ft.	In Use



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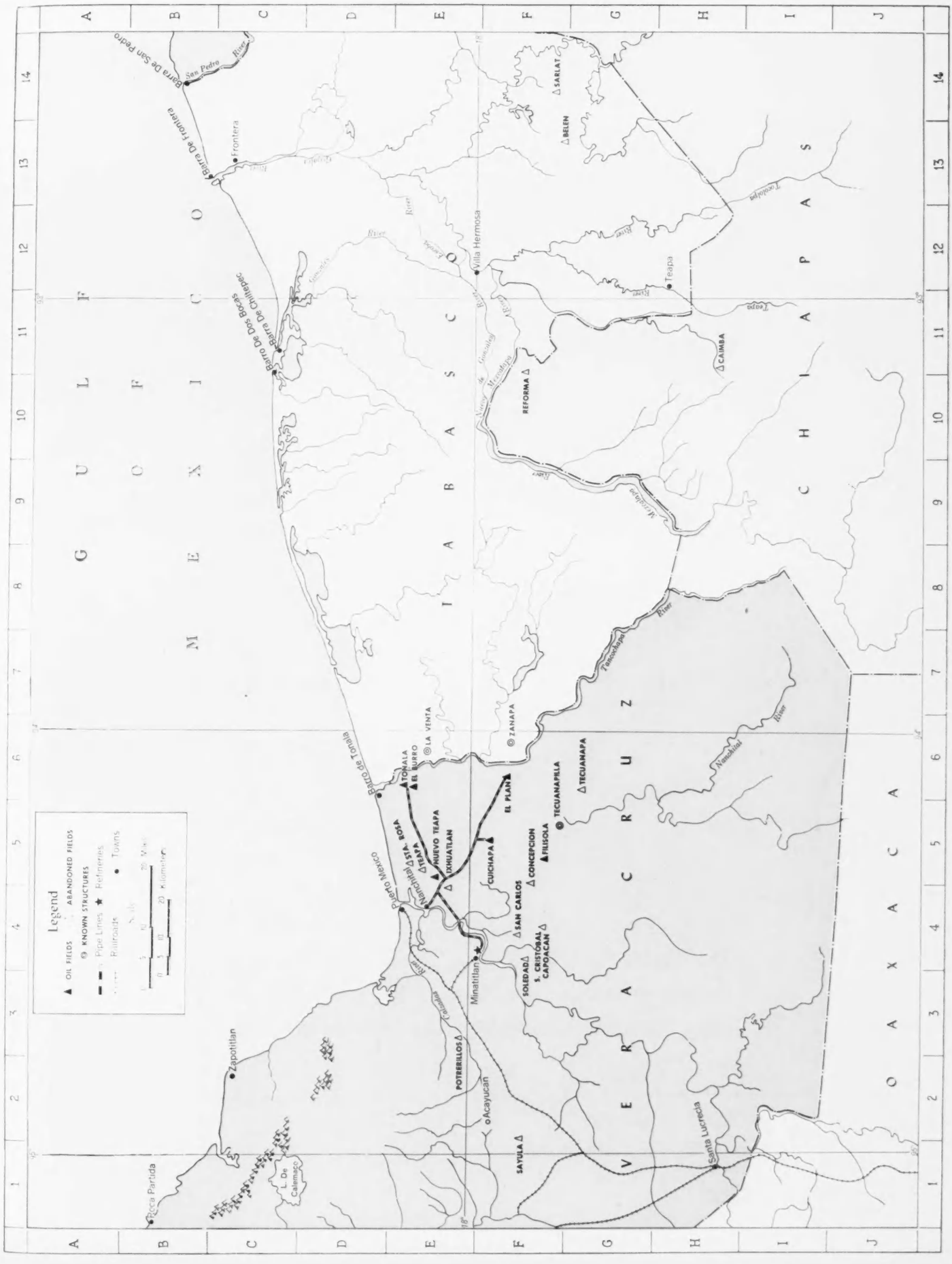
MEXICO—Isthmus Fields



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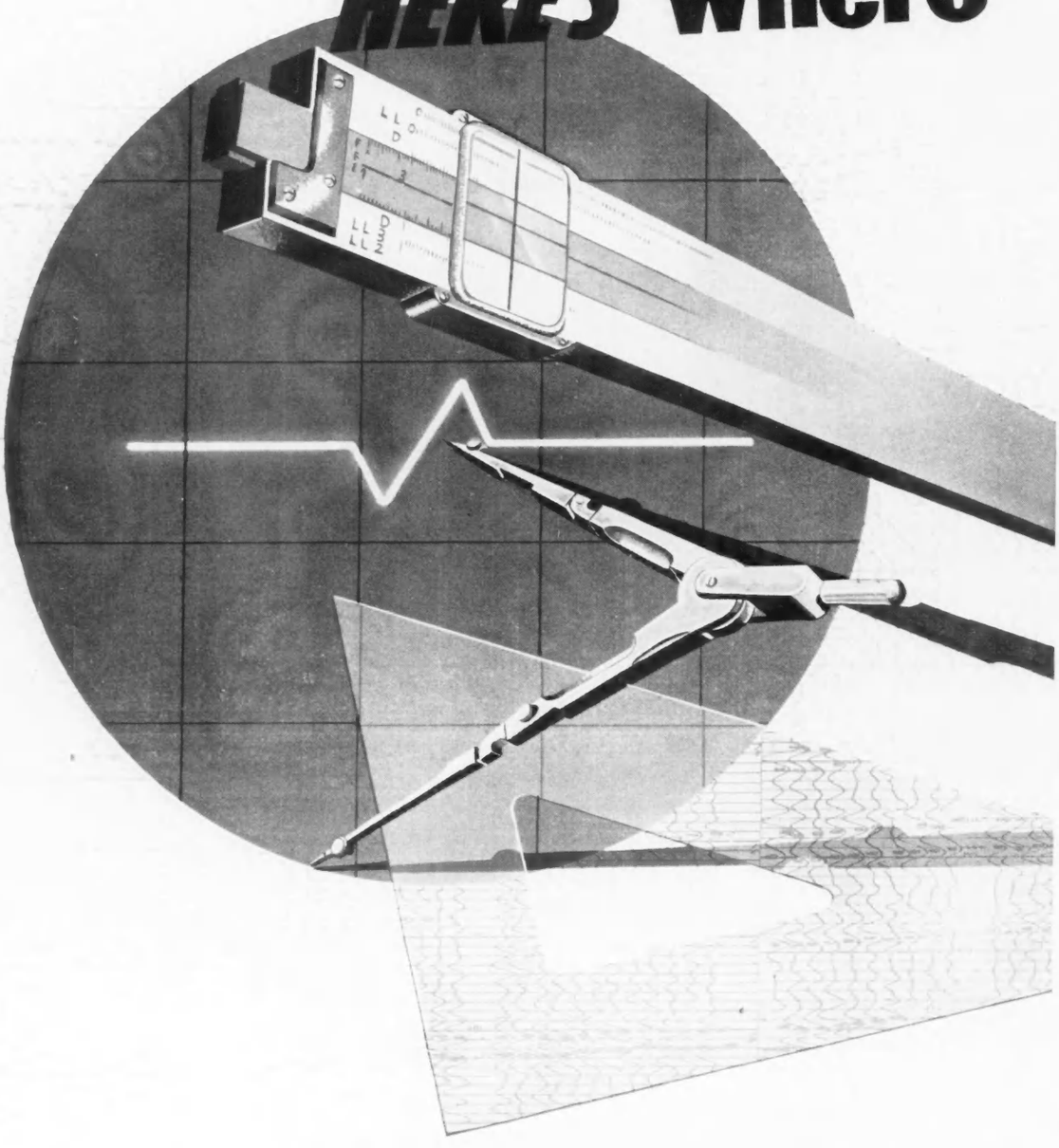

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UNITED STATES

UNITED States production of crude oil again set a new all-time record in 1946, as domestic consumption was greater than ever before, while U. S. stocks of crude and products were substantially increased after having been drawn down to low levels during the war. For 1947 a further increase in U. S. crude production and a new record are fairly well assured, in response to another gain in consumption.

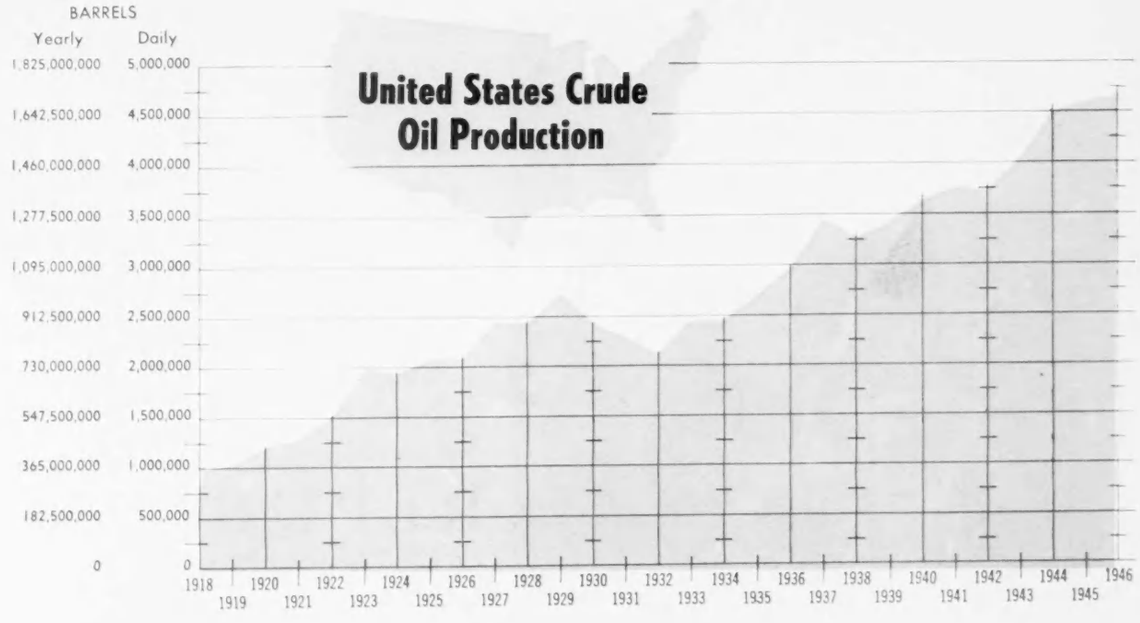
In 1946 United States crude oil production totaled approximately 1,731,889,000 barrels, equivalent to a daily average of 4,745,000 barrels. That was 1.2 percent more than the output of 1,711,103,000 barrels or 4,688,000 daily in 1945, the final year of the war. The increase over 1945 occurred in the face of general expectations of a substantial postwar decrease in consumption and production.

This surprising development resulted from several causes that had not been anticipated. Among the factors was the continued heavy use of fuel oils by the Navy and the Merchant Marine and the greater than expected consumption of motor fuel in connection with the end of gasoline rationing and the postwar readjustment of the population, while old automobiles stayed in use longer than expected and were used more extensively. Also, an important factor in U. S. petroleum demand has been the strong demand for heating oils, limited only by the capacity of oil burner manufacturers.

For 1947 similar factors will bring further increase in U. S. demand for petroleum products, but increases will be more pronounced because manufacturers of automobiles, oil burners, diesel engines, airplanes, trucks, busses, tractors, locomotives, boats, and numerous other oil-consuming machines have gone through the reconversion period and are turning out their products in mass production volume approaching or exceeding prewar rates. Although early forecasts indicated for 1947 an increase of around 4 or 5 percent in the total demand for all oils, actual demand has run above the forecasts, and later indications are that demand will show an increase of 6 to 9 percent over 1946.

So strong has been the demand that the United States has had to maintain both production of crude oil and refinery runs to stills at levels close to capacity, while it also has had to step up imports in meeting all requirements. In the urgent need for supplies to balance demand, the industry has found it necessary to embark upon an extensive pipe line building program in order to use more fully the producing ability of U. S. fields. Meanwhile, exploration for new reserves has been increased in 1947 over the record breaking levels of 1946. All available tankers are in use in the coastwise and foreign trade, and U. S. refining capacity is almost fully utilized, indicating that during the year the capacity of plants may be seriously taxed. Storage facilities also may prove inadequate.

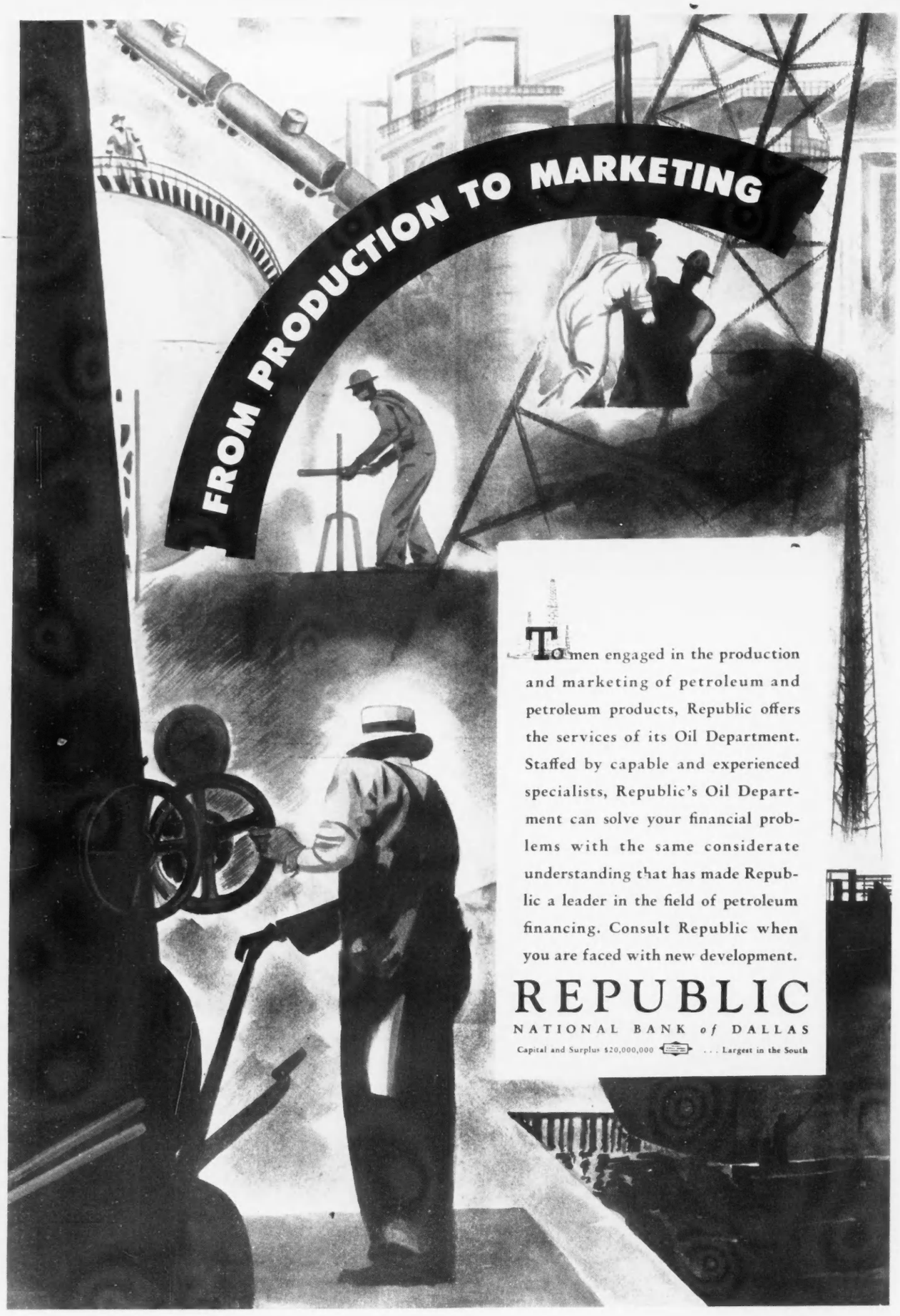
Incentive for intensification of U. S. oil industry operations and for expansion of facilities has been provided through upward revisions of prices of crude oil and petroleum



(All Figures in Barrels)

YEAR	Yearly Total	Daily Average	YEAR	Yearly Total	Daily Average	YEAR	Yearly Total	Daily Average
1918	355,928,000	975,000	1927	901,129,000	2,469,000	1937	1,279,160,000	3,505,000
1919	378,367,000	1,037,000	1928	901,474,000	2,469,000	1938	1,214,355,000	3,327,000
1920	442,929,000	1,213,000	1929	1,007,323,000	2,760,000	1939	1,264,962,000	3,466,000
1921	472,183,000	1,294,000	1930	898,011,000	2,460,000	1940	1,353,214,000	3,707,000
1922	557,531,000	1,528,000	1931	851,081,000	2,332,000	1941	1,402,228,000	3,842,000
1923	732,407,000	2,007,000	1932	785,159,000	2,151,000	1942	1,386,645,000	3,799,000
1924	713,940,000	1,956,000	1933	905,656,000	2,481,000	1943	1,505,613,000	4,124,900
1925	763,743,000	2,092,000	1934	908,065,000	2,488,000	1944	1,677,753,000	4,596,500
1926	770,874,000	2,112,000	1935	996,596,000	2,730,000	1945	1,711,103,000	4,687,900
			1936	1,099,687,000	3,013,000	1946	1,731,889,000	4,744,900

Source: U. S. Bureau of Mines, except for latest year, which has been calculated with aid of Bureau statistics for first 10 months and American Petroleum Institute weekly reports for last two months.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products, and the industry is making vigorous efforts to fulfill the unprecedented requirements for oils.

During the war years and the immediate postwar period, the heavy drains made on U. S. petroleum reserves made the nation exceptionally concerned with the adequacy of its reserves of oil as well as many other minerals. Consequently, there is less opposition than formerly to the idea of supplementing domestic reserves with foreign supplies where necessary, and prominent U. S. oil companies have taken a leading role in a program of greatly expanding foreign petroleum development. So far, however, this American participation in foreign oil development has not been based to any great extent on the idea of importing large volumes of foreign oil into the United States. The plans have contemplated primarily that the Eastern Hemisphere should be made independent of the Western Hemisphere for supplies of oil by developing more fully the rich reserves of the Eastern Hemisphere. Formerly, much oil that was used in Europe came from Venezuela and the United States. But henceforth, it is contemplated, European import requirements will be met primarily from the Middle East, which also can readily supply other regions of the Eastern Hemisphere. Meanwhile, it is reasoned, the Western Hemisphere will seek to meet its own needs from its own fields, primarily, with due consideration of the need for maintenance of adequate reserves. Even under such a general policy, the Western Hemisphere would be at some disadvantage as compared with the Eastern Hemisphere in the relation of reserves to production, as it would be producing over one half of world output while holding somewhat less than half of world reserves. Also under this contemplated general policy, there is the implication that the important reserves of the Caribbean area will find markets primarily in South American countries and the United States, with the U. S. ceasing to be an important exporting country and becoming a larger importer of Venezuelan crude. Even if U. S. domestic production shows substantial further increase above recent rates, there will be need for increased imports.

Nevertheless, it is to be expected that very vigorous effort will be put forth by the domestic U. S. oil industry toward meeting domestic needs from domestic sources. Especially significant is the beginning now being made toward development of the important reserves confidently assumed to be present off the shores of Texas, Louisiana, and other Gulf Coast states. Several wells already have been drilled out in the open Gulf, and the summer of 1947 will bring the drilling of a considerable number of additional wells upon ocean locations in the Gulf. These are pioneering ventures, but they are being undertaken by competent and successful companies which consider them practical, and it is quite likely that within several years there will be important U. S. production from the Continental Shelf. While drilling in the Gulf may be comparatively expensive, it is contemplated that in some cases single wells can be made to drain areas of 5000 acres or so, with benefit of field-wide leaseholds on state-owned tidelands.

Another new and significant factor in domestic oil production in the United States henceforth will be the making of liquid fuels from natural gas.

U. S. Crude Production, December and Years, 1941, 1945 and 1946

From U. S. Bureau of Mines, except November and December, 1946, estimated from A. P. I. weekly reports, and breakdown of Louisiana and Texas by districts based on various sources.

(THOUSANDS OF BARRELS)

STATE OR DISTRICT	PRODUCTION IN DECEMBER: Monthly Total in December				PRODUCTION IN DECEMBER: Daily Average for December			PRODUCTION DURING YEAR: Year Total			PRODUCTION DURING YEAR: Daily Average for Year				Year's Prod. in 1945 as Percent of U.S. Total	Cumulative Prod. To End of 1946	
	1941	1945	1946	% Diff. '45-'46	1941	1945	1946	1941	1945	1946	1941	1945	1946	% Diff. '45-'46		Thousands of Barrels	As Percent of U.S. Cum.
Alabama		24	35	+ 45.8		0.8	1.1		181	387		0.5	1.1	+120.0	0.02	611	
Arkansas	2,304	2,377	2,291	— 3.6	74.3	76.7	73.9	26,327	28,613	28,036	72.1	78.4	76.8	— 2.0	1.62	673,039	2.03
California	19,590	26,090	27,209	+ 4.3	631.9	841.6	877.7	230,263	326,482	315,105	630.9	894.5	863.3	— 3.5	18.19	7,286,235	21.93
Colorado	200	656	1,194	+ 82.0	6.5	21.2	38.5	2,150	4,959	12,008	5.9	13.6	32.9	+141.9	0.69	66,476	0.20
Florida		2	7	+250.0		0.1	0.2		30	54		0.1	0.1	+ 80.0		100	
Illinois	12,192	6,487	6,221	— 3.4	393.3	207.7	200.7	132,393	75,210	75,547	362.7	206.1	207.0	+ 0.4	4.36	1,248,886	3.76
Indiana	615	427	586	+ 37.0	19.8	13.8	18.9	7,411	4,868	6,812	20.3	13.3	18.7	+ 40.6	0.40	167,345	0.50
Kansas	7,957	7,366	8,365	+ 13.6	256.7	237.6	269.8	83,242	95,997	97,204	228.1	263.0	266.3	+ 1.3	5.61	1,673,597	5.04
Kentucky	394	898	982	+ 4.4	12.7	28.8	30.1	4,762	10,325	10,775	13.0	28.3	29.5	+ 4.2	0.62	215,061	0.65
*Louisiana	10,948	11,323	12,523	+ 10.6	353.2	365.2	404.0	115,908	130,566	142,618	317.6	357.7	390.7	+ 9.2	8.24	1,817,665	5.47
North Louisiana	2,238	2,150	2,899	+ 34.8	72.2	69.3	93.5	24,991	23,589	30,707	68.5	64.6	84.1	+ 30.2	1.77	706,786	2.13
South Louisiana	8,710	9,173	9,624	+ 4.9	281.0	295.9	310.5	90,917	106,977	111,911	249.1	293.1	306.6	+ 4.6	6.46	1,141,233	3.44
Michigan	1,759	1,388	1,365	— 1.7	56.7	44.8	44.0	16,359	17,259	17,105	44.8	47.3	46.9	— 0.8	0.99	256,841	0.77
Mississippi	2,185	1,652	2,573	+ 55.8	70.5	53.3	83.0	15,327	18,775	24,143	42.0	51.4	66.1	+ 28.6	1.39	126,729	0.38
Missouri	4	3	4	+ 33.3	0.1	0.1	0.2	47	45	51	0.1	0.1	0.1	+ 13.3		389	
Montana	683	680	703	+ 3.4	22.0	21.9	22.7	7,526	8,397	8,877	20.6	23.0	24.3	+ 5.7	0.51	132,909	0.40
Nebraska	169	26	22	— 15.4	5.5	0.8	0.7	1,898	305	276	5.2	0.8	0.8	— 9.5	0.02	5,046	0.02
New Mexico	3,508	2,952	3,190	+ 8.1	113.2	95.2	102.9	39,569	37,281	36,784	108.4	102.1	100.8	— 1.3	2.13	498,388	1.50
New York	468	367	418	+ 13.9	15.1	11.8	13.5	5,185	4,648	4,899	14.2	12.7	13.4	+ 5.5	0.28	159,096	0.48
Ohio	324	214	260	+ 21.5	10.4	6.9	8.4	3,510	2,828	2,938	9.6	7.8	8.1	+ 3.8	0.17	607,455	1.83
Oklahoma	18,310	11,857	11,489	— 3.1	429.4	382.5	370.6	154,702	138,036	135,122	423.8	378.2	370.2	— 2.1	7.80	5,648,796	17.00
Pennsylvania	1,527	963	1,107	+ 15.0	49.3	31.1	35.7	16,750	12,515	13,067	45.9	34.3	35.8	+ 4.4	0.76	1,076,644	3.24
Tennessee	1	1	1					12	12	11				— 8.3		469	
*Texas	47,486	59,916	61,896	+ 3.3	1,530.2	1,932.8	1,996.6	505,572	755,533	758,858	1,385.1	2,070.0	2,079.1	+ 0.4	43.82	10,425,332	31.38
East Texas Field	11,945	9,526	9,785	+ 2.7	385.3	307.3	315.6	132,915	129,097	120,256	364.2	353.7	329.5	— 6.8	6.94	2,357,467	7.10
Rest of East Texas	2,711	4,117	4,160	+ 1.0	87.5	132.8	134.2	29,574	49,659	51,934	81.0	136.0	142.3	+ 4.6	3.00	767,005	2.31
North Texas	4,341	4,637	4,731	+ 2.0	140.0	149.6	152.6	48,396	53,776	57,949	132.6	147.3	158.8	+ 7.8	3.35	1,374,534	4.14
West Texas	9,364	14,431	16,314	+ 13.0	302.1	465.5	526.2	93,404	172,303	190,242	255.9	472.1	521.2	+ 10.4	10.98	1,904,226	5.73
Texas Panhandle	2,868	2,511	2,515	+ 0.2	92.5	81.0	81.1	26,070	31,890	30,309	79.6	87.4	83.0	— 5.0	1.75	568,492	1.71
Gulf Coast Upper	9,399	14,559	13,130	— 9.8	303.2	469.6	423.6	99,187	189,956	174,363	271.7	520.4	477.7	— 8.2	10.07	2,211,593	6.66
Southwest Texas	6,981	9,737	11,261	+ 15.7	225.2	314.1	363.3	75,721	120,777	132,691	207.5	330.9	363.5	+ 9.9	7.66	1,256,476	3.78
Utah								4			0.1					11	
West Virginia	302	226	229	+ 4.1	9.7	7.1	7.4	3,433	2,879	2,947	9.4	7.9	8.1	+ 2.5	0.17	430,022	1.30
Wyoming	2,558	2,661	3,225	+ 21.2	82.5	85.8	104.0	29,878	35,359	38,262	81.9	96.9	104.8	+ 8.2	2.21	703,930	2.12
Undistributed										3						577	
Total United States	128,434	138,495	145,844	+ 5.3	4,143.0	4,467.6	4,704.6	1,402,228	1,711,103	1,731,889	3,841.7	4,688.0	4,744.9	+ 1.2	100.00	33,221,649	100.00

* Data on Louisiana and Texas by districts are from various sources and so do not agree exactly with state totals, which are on Bureau of Mines basis.

WARREN

SILVER ANNIVERSARY
25
1922 YEAR 1947

Twenty-five Years' Service

This Silver Anniversary of Warren Petroleum Corporation is more than a birthday — it presents an opportunity to express our appreciation of the confidence, friendship and patronage of our many customers here and abroad.

It marks a quarter-century of progress which has enabled us to become the largest natural gasoline marketing organization in the world, and one of the largest natural gasoline manufacturers in the United States.

NATURAL GASOLINE

Chemical Grade
HYDROCARBONS
Iso-Pentane
Normal Butane
Iso-Butane
Propane
Hexane
STA-VOL-ENE

SILVER ANNIVERSARY 25 1922 YEAR 1947

Warren Petroleum Corporation

"Just Natural Gasoline and Its By-Products"

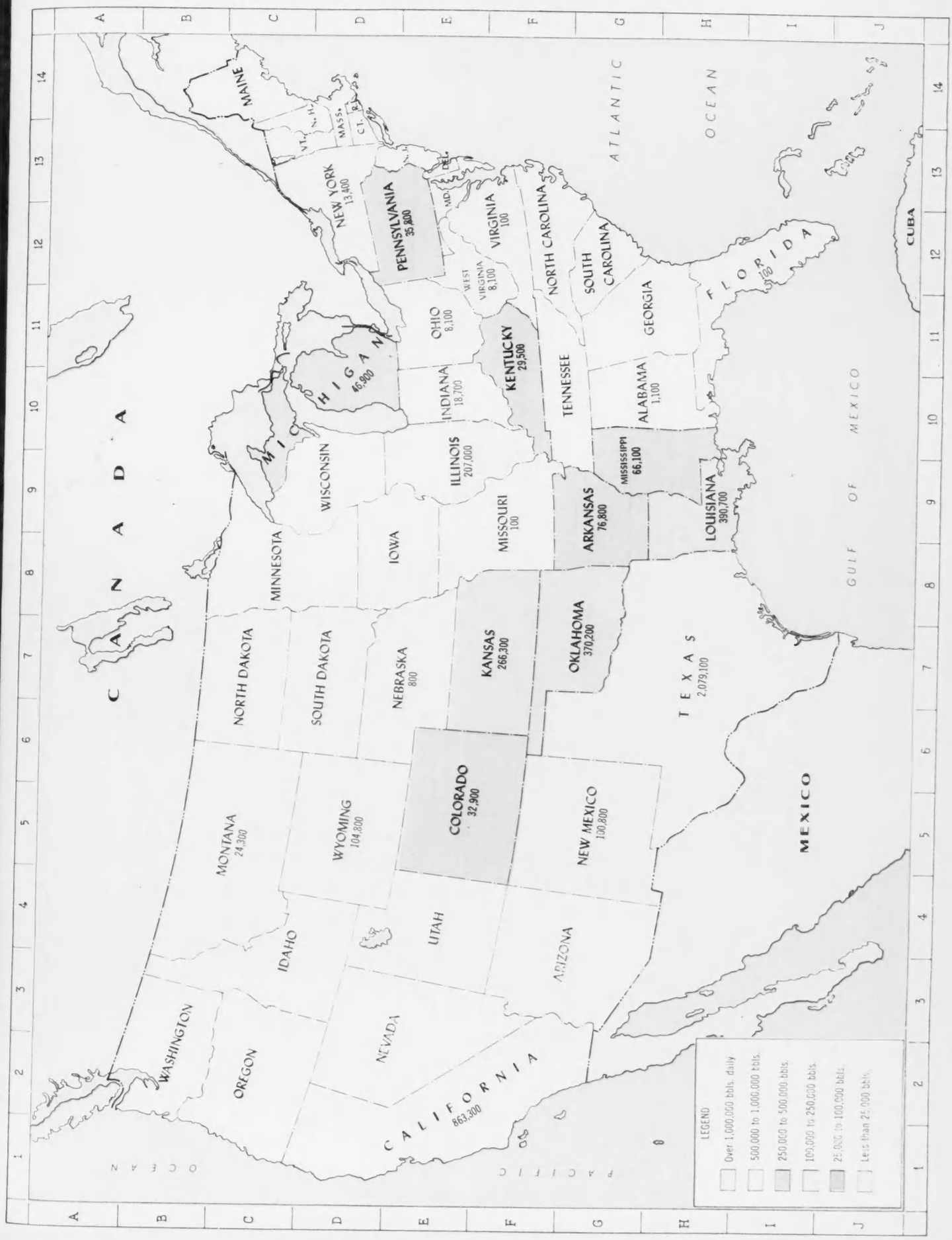
Manufacturers, Exporters and Marketers of Natural Gasoline and Liquefied Petroleum Gas

Tulsa 2, Oklahoma

CABLE ADDRESSES: Stavolene, Warren

Export Terminals: Corpus Christi, Port Arthur, Baytown, Texas City, and Norsworthy, Houston, Texas; Lake Charles, La.; Marcus Hook, Pa.

UNITED STATES—Crude Oil Production



UNITED STATES—

Data in thousands of barrels; from *Mineral Resources and Minerals Yearbook*, except where otherwise indicated in footnotes.

Year	Alabama	Arkansas	California	Colorado	Florida	Illinois	Indiana	Kansas	Kentucky	Louisiana	Michigan	Mississippi	Missouri	Montana	Nebraska	New Mexico
1859																
1860									[E]							
1861									[E]							
1862									[E]							
1863									[E]							
1864									[E]							
1865									[E]							
1866									[E]							
1867									[E]							
1868									[E]							
1869									[E]							
1870									[E]							
1871									[E]							
1872									[E]							
1873									[E]							
1874									[E]							
1875									[E]							
1876			12						[G E]							
1877			13						[G E]							
1878			15						[G E]							
1879			20						[G E]							
1880			40						[G E]							
1881			100						[G E]							
1882			129						[G E]							
1883			143						[G5]							
1884			262						[G4]							
1885			325						[G5]							
1886			377						[G5]							
1887			678	76					[G5]							
1888			690	298					[G5]							
1889			303	317		1	33	1	[G5]				[H]			
1890			307	369		1	64	1	[G6]				[H]			
1891			324	666		1	137	1	[G9]				[H]			
1892			385	824		1	698	5	[G7]				[H]			
1893			470	594		1	2,335	18	[G3]				[H]			
1894			706	516		[H]	3,689	40	[G2]				[H]			
1895			1,209	438		[H]	4,386	44	[G2]				[H]			
1896			1,253	361		[H]	4,681	114	[G2]				[H]			
1897			1,903	385		1	4,122	81	[G H]				[H]			
1898			2,257	444		[H]	3,731	72	[G6]				[H]			
1899			2,642	390		[H]	3,848	70	[G18]				[H]			
1900			4,325	317		[H]	4,874	75	[G62]		[J]		[J2]			
1901			8,787	461		[H]	5,757	179	[G137]		[J]		[J2]			
1902			13,984	397		[H]	7,481	332	[G185]	549	[J]		[J1]			
1903			24,382	484			9,186	932	[G554]	918	[J]		[J3]			
1904			29,649	501			11,339	4,251	[G998]	2,959	[J]		[J3]			
1905			33,428	376		181	10,964	[I]3,750	[G1,217]	8,910	[J]		[J3]			
1906			33,099	328		4,397	7,674	[I]3,627	[G1,214]	9,077	[J]		[J3]			
1907			39,748	332		24,282	5,128	2,410	[G821]	5,000	[J]		[J4]			
1908			44,855	380		33,686	3,283	1,801	728	5,789	[J]		[J15]			
1909			55,472	311		30,898	2,296	1,264	639	3,060	[J]		[J6]			
1910			73,011	240		33,143	2,160	1,128	469	6,841	[J]		[J4]			
1911			81,134	227		31,317	1,695	1,279	472	10,721	[J]		[J8]			
1912			87,269	206		28,602	970	1,593	484	9,263	[K]					
1913			97,788	189		23,894	956	2,375	525	12,499	[K]		[K]			[K]
1914			99,775	223		21,920	1,336	3,104	503	14,309	[K]		[K]			
1915			86,592	208		19,042	876	2,823	437	18,192	[K]		[K]			
1916			90,952	197		17,714	769	8,738	[L]1,202	15,248	[K]		[K]	45		
1917			93,878	121		15,777	760	36,536	[L]3,088	11,392	[K]			100		
1918			97,532	143		13,366	878	45,451	[L]4,368	16,043	[K]			69		
1919			101,183	121		11,960	972	33,048	9,278	17,188	[K]		[K]	90		[K]
1920		[K]	103,377	111		10,774	945	39,005	8,738	35,714			[K]	340		[K]
1921		10,473	112,600	108		10,043	1,158	36,456	9,013	27,103			[K]	1,509		[K]
1922		12,712	138,468	97		9,383	1,087	31,766	8,973	35,376			[K]	2,449		[K]
1923		36,610	262,876	86		8,707	1,043	28,250	8,069	24,919			[K]	2,782		[K]
1924		46,028	228,933	445		8,081	935	28,836	7,407	21,124				2,815		98
1925		77,398	232,492	1,226		7,863	829	38,357	6,759	20,272	4			4,091		1,060
1926		58,332	224,673	2,768		7,760	808	41,498	6,274	23,201	94			7,727		1,666
1927		40,005	231,196	2,831		6,904	852	41,069	6,719	22,818	439			5,058		1,226
1928		32,096	231,811	2,774		6,462	1,052	38,596	7,359	21,847	594			4,015		943
1929		24,917	292,534	2,358		6,319	981	42,813	7,775	20,554	4,528			3,980		1,830
1930		19,702	227,329	1,656		5,736	994	41,638	7,389	23,272	3,911			3,349		10,189
1931		14,791	188,830	1,545		5,039	840	37,018	6,456	21,804	3,789			2,830		15,237
1932		12,051	178,128	1,136		4,673	806	34,848	6,287	21,807	6,910		[K]	2,457		12,435
1933		11,686	172,010	949		4,244	737	41,976	4,608	25,168	7,942	[K]	[K]	2,273		14,116
1934		11,182	174,395	1,139		4,479	828	46,482	4,860	32,869	10,603	[K]	[K]	3,603		16,864
1935		11,008	207,822	1,560		4,322	777	54,843	5,258	50,330	15,776	[K]	[K]	4,603		20,483
1936		10,469	214,773	1,650		4,475	822	58,317	5,633	80,491	11,928		[K]	5,868		27,223
1937		11,764	238,521	1,605		7,499	844	70,761	5,484	90,924	16,628		[K]	5,805		38,854
1938		18,180	249,749	1,412		24,075	995	60,064	5,821	95,208	18,745		[K]	4,946		35,759
1939		21,238	221,354	1,404		94,912	1,711	60,703	5,621	93,646	23,462	107	40	5,960	2	37,637
1940		25,775	223,881	1,626		147,647	4,978	66,139	5,188	103,584	19,753	4,400	44	6,728	276	39,129
1941		26,327	230,263	2,150		132,393	7,411	83,242	4,762	115,908	16,359	15,327	47	7,526	1,898	39,569
1942		26,628	248,326	2,199		106,391	6,743	97,636	4,594	115,785	21,754	28,833	36	8,074	1,237	31,544
1943		27,600	284,188	2,320	4	82,260	5,283	106,178	7,883	125,592	20,768	18,807	36	7,916	635	38,896
1944	43	29,418	311,793	2,044	12	77,413	5,118	98,762	9,621	129,207	18,490	16,337	36	8,627	417	39,555
1945	181	28,613	326,482	4,959	30	75,210	4,868	95,997	10,325	130,566	17,259	18,775	45	8,397	305	37,281
1946[P]	387	28,036	315,105	12,008	54	75,347	6,812	97,204	10,775	142,618	17,105	24,143	51	8,877	276	36,784
Total	611	673,039	7,286,235	66,476	100	1,248,886	167,345	1,673,597	215,061	1,817,665	256,841	126,729	389	132,909	5,046	498,388

[A] Utah production estimated at 3,650 barrels in 1939; 3,126 barrels in 1940; and 189,726 barrels cumulative thorugh 1940.

[B] *Petroleum in the United States and Possessions*, by Arnold and Kemnitzer, shows for Alaska the following data: 1904-1919, estimated, 56,000 barrels; 1920, 11,000 barrels; 1921, 10,000 barrels; 1922-1928, estimated, 73,000 barrels; total, 1904-1928, 150,000 barrels.

[C] "Unclassified" includes 1912, Alaska and Michigan; 1913, Alaska, Michigan, Missouri and New Mexico; 1914-16, Alaska, Michigan and Missouri; 1917-18, Alaska and Michigan; 1919, Alaska, Michigan, Missouri and New Mexico; 1920, Alaska, Arkansas, Missouri, New Mexico and Utah; 1921-23, Alaska, Missouri and New Mexico; 1924-31, Alaska and Utah; 1932, Alaska, Missouri and Utah; 1933, Alaska, Mississippi, Missouri and Utah; 1934, Mississippi, Missouri and Utah; 1935, Mississippi, Missouri, Tennessee and Utah; 1936-40, Missouri, Tennessee and Utah; 1943, Virginia, 2; 1946, Virginia, 3.

[D] Pennsylvania and New York separated in years 1864-1881, by aid of *Petroleum in the United States and Possessions*, by Arnold and Kemnitzer.

[E] *Petroleum in the United States and Possessions*, by Arnold and Kemnitzer, gives the following additional estimates which are not shown by the official *Mineral Resources;* Ohio, 1860-1875, 200,000 barrels; West Virginia, 1860-1875, 2,800,000 barrels; Kentucky, 1860-1882, 161,000 barrels.

Crude Oil Production

Data in thousands of barrels; from *Mineral Resources and Minerals Yearbook*, except where otherwise indicated in footnotes.

New York	Ohio	Oklahoma	Pennsylvania	Tennessee	Texas	[A] Utah	West Virginia	Wyoming	[B] Alaska	[C] Unclassified	Total United States	Total Value At Wells (Thousands of Dollars)	[O] Average Value Per Bbl.	YEAR
.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	2	$ 32	$20.00	1859
.....	[E]	.....	500	.....	.....	.....	[E]	.....	.....	.....	500	4,800	9.60	1860
.....	[E]	.....	2,114	.....	.....	.....	[E]	.....	.....	.....	2,114	1,036	.52	1861
.....	[E]	.....	3,057	.....	.....	.....	[E]	.....	.....	.....	3,057	3,210	1.05	1862
.....	[E]	.....	2,611	.....	.....	.....	[E]	.....	.....	.....	2,611	8,226	3.15	1863
[D F H]	[E]	.....	[D F] 2,116	.....	.....	.....	[E]	.....	.....	.....	2,116	20,897	8.15	1864
[D] 100	[E]	.....	[D] 2,398	.....	.....	.....	[E]	.....	.....	.....	2 498	16,460	6.59	1865
[D] 144	[E]	.....	[L] 3,454	.....	.....	.....	[E]	.....	.....	.....	3,598	13,455	3.75	1866
[D] 134	[E]	.....	[D] 3,213	.....	.....	.....	[E]	.....	.....	.....	3.347	8,067	2 40	1867
[D] 146	[E]	.....	[D] 3.500	.....	.....	.....	[E]	.....	.....	.....	3.646	13,217	3.62	1868
[D] 169	[E]	.....	[D] 4,046	.....	.....	.....	[E]	.....	.....	.....	4,215	23.730	5.60	1869
[D] 211	[E]	.....	[D] 5,050	.....	.....	.....	[E]	.....	.....	.....	5,261	20,504	3.90	1870
[D] 208	[E]	.....	[D] 4,997	.....	.....	.....	[E]	.....	.....	.....	5.205	22.591	4.40	1871
[D] 252	[E]	.....	[D] 6,041	.....	.....	.....	[E]	.....	.....	.....	6 293	21,440	3.75	1872
[D] 396	[E]	.....	[D] 9 498	.....	.....	.....	[E]	.....	.....	.....	9 894	18,100	1.80	1873
[D] 437	[E]	.....	[D] 10,490	.....	.....	.....	[E]	.....	.....	.....	10,927	12,648	1.15	1874
[D] 352	[E]	.....	[D] 8,436	.....	.....	.....	[E]	.....	.....	.....	8,788	7,368	.97	1875
[D] 359	32	.....	[D] 8,610	[G]	.....	.....	120	.....	.....	.....	9,133	22,983	2.52	1876
[D] 525	30	.....	[D] 12,610	[G]	.....	.....	172	.....	.....	.....	13,350	31,789	2.38	1877
[D] 607	38	.....	[D] 14,557	[G]	.....	.....	180	.....	.....	.....	15,397	18,045	1.17	1878
[D] 787	29	.....	[D] 18,898	[G]	.....	.....	180	.....	.....	.....	19.914	17.211	.86	1879
[D] 1,041	39	.....	[D] 24,987	[G]	.....	.....	179	.....	.....	.....	26,286	24,601	.94	1880
[D] 1,095	34	.....	[D] 26,281	[G]	.....	.....	151	.....	.....	.....	27,661	25,448	92	1881
6,685	40	.....	23,368	[G]	.....	.....	128	.....	.....	.....	30 350	23,631	.78	1882
4,004	47	.....	19,125	[G]	.....	.....	126	.....	.....	.....	23,450	25,790	1.10	1883
3,231	90	.....	20,541	[G]	.....	.....	90	.....	.....	.....	24,218	20,596	.85	1884
2,658	662	.....	18,118	[G]	.....	.....	91	.....	.....	.....	21,859	19,198	.88	1885
2,151	1,783	.....	23,647	[G]	.....	.....	102	.....	.....	.....	28,065	19,996	.71	1886
2,075	5,023	.....	20,281	[G]	.....	.....	145	.....	.....	.....	28,283	18,877	.67	1887
1,789	10,011	.....	14 700	[G]	.....	.....	119	.....	.....	.....	27,612	17,948	.65	1888
1,897	12,472	.....	19 591	[G]	[H]	.....	544	.....	.....	.....	35 164	26,963	.77	1889
1,658	16,125	.....	26,800	[G]	[H]	.....	493	.....	.....	.....	45,824	35,365	.77	1890
1,585	17,740	[H]	31,424	[G]	[H]	.....	2 406	.....	.....	.....	54,293	30,527	.56	1891
1,273	16,363	[H]	27,149	[G]	[H]	.....	3,810	.....	.....	.....	50,515	25,907	.51	1892
1,032	16,249	[H]	19,283	[G]	[H]	.....	8 446	.....	.....	.....	48,431	28,950	60	1893
942	16,792	[H]	18,078	[G]	[H]	.....	8,577	2	.....	.....	49,344	35,522	.72	1894
913	19,545	[H]	18,231	[G]	[H]	.....	8,120	4	.....	.....	52,892	57,632	1.09	1895
1,205	23,941	[H]	19,379	[G]	1	.....	10,020	3	.....	.....	60,960	58,519	.96	1896
1,279	21,561	1	17,983	[G]	66	.....	13,090	4	.....	.....	60,476	40,874	.68	1897
1,205	18,739	.....	14,743	[G]	546	.....	13,615	6	.....	.....	55,364	44,193	.80	1898
1,321	21,142	.....	13,054	[G]	669	.....	13,911	6	.....	.....	57,071	64,604	1.13	1899
1,301	22,363	6	13,258	[G]	836	.....	16,196	6	.....	.....	63,621	75,989	1.19	1900
1,207	21,648	10	12,625	[G]	4,394	.....	14,177	5	.....	.....	69,389	66,417	.96	1901
1,120	21,014	37	12,064	[G]	18,084	.....	13,513	6	.....	.....	88,767	71,179	.80	1902
1,163	20,480	139	11,355	[G]	17,956	.....	12,900	9	.....	.....	100,461	94,694	.94	1903
1,113	18,877	1,367	11,126	[G]	22,241	.....	12,645	12	[N]	.....	117,081	101,175	.86	1904
1,118	16,347	[I] 8,264	10,437	[G]	28,136	.....	11,578	8	.....	.....	134,717	84,157	.62	1905
1,243	14,788	[I] 18,091	10,257	[G]	12,568	.....	10,121	7	.....	.....	126,494	92,445	.73	1906
1,212	12,207	43,524	10,000	[G]	12,323	[M]	9,095	[M] 9	[N]	.....	166,095	120,107	.72	1907
1,160	10,859	45,799	9,424	.....	11,207	[M]	9,523	[M] 18	.....	.....	178,527	129,079	.72	1908
1,135	10,633	47,859	9,299	.....	9,534	[M]	10,745	[M] 20	.....	.....	183,171	128,329	.70	1909
1,054	9,916	52,029	8,795	.....	8,899	[M]	11,753	[M] 115	.....	.....	209,557	127,900	.61	1910
953	8,817	56,069	8,248	.....	9,526	[M]	9,796	[M] 187	[N]	.....	220,449	134,045	.61	1911
874	8,969	51,427	7,838	.....	11,735	[M]	12,129	[M] 1 572	[K]	4	222,935	164,213	.74	1912
948	8,781	63,579	7,917	.....	15,010	[N]	11,567	2,407	[K]	11	248,446	237,121	95	1913
939	8,536	73,632	8,170	.....	20,068	[N]	9,680	3,560	[K]	8	265,763	214,125	.81	1914
888	7,825	97,915	7,838	.....	24,943	[N]	9,265	4,246	[K]	14	281,104	179,463	.64	1915
874	7,744	107,072	7,593	[L] 1	27,645	[N]	8,731	6,234	[K]	8	300,767	330,900	1.10	1916
880	7,751	107,508	7,733	[L] 12	32,413	[N]	8,379	8,978	[K]	10	335 316	522,635	1.56	1917
809	7,285	103,347	7,408	[L] 8	38,750	[N]	7,867	12,596	[K]	8	355,928	703,944	1 98	1918
851	7,736	86,911	8,137	15	79,366	[N]	8,327	13,172	[K]	12	378.367	760 266	2.01	1919
906	7,400	106,206	7,438	14	96,868	[K]	8,249	16,831	[K]	13	442,929	1.360,745	3.07	1920
988	7,335	114,634	7,418	12	106 166	.....	7,822	19,333	[K]	12	472,183	814,745	1.73	1921
1,000	6,781	149,571	7,425	10	118,684	.....	7,021	26,715	[K]	13	557,531	895,111	1.61	1922
1,250	7 085	160,929	7,609	8	131,023	.....	6,358	44,785	[K]	18	732,407	978,430	1.34	1923
1,440	6,811	173,538	7,486	10	134,522	[K]	5,920	39,498	[K]	13	713,940	1,022,683	1.43	1924
1 695	7,212	176,768	8,097	24	144 648	[K]	5,763	29,173	[K]	12	763,743	1,284,960	1.68	1925
1,956	7,272	179,195	8,961	43	166,916	[K]	5,946	25,776	[K]	8	770,874	1,447,760	1 88	1926
2 242	7,593	277,775	9,526	60	217,389	[K]	6,023	21,307	[K]	7	901,129	1,172,830	1.30	1927
2,603	7,015	249,857	9,956	46	257,320	[K]	5,661	21,461	[K]	6	901,474	1,054,880	1.17	1928
3,377	6,743	255,004	11,820	19	296,876	[K]	5,574	19,314	[K]	7	1,007,323	1,280,417	1.27	1929
3,647	6,486	216,486	12,803	21	290,457	[K]	5,071	17,868	[K]	7	898,011	1,070,200	1.19	1930
3,363	5,327	180,574	11,892	6	332,437	[K]	4,472	14,834	[K]	7	851,081	550,630	65	1931
3,508	4,644	153,244	12,412	5	312,478	[K]	3,876	13,418	[K]	16	785,159	680,460	.87	1932
3,181	4,235	182,251	12,624	5	402,609	[K]	3,815	11,227	[K]	30	905,656	608,000	.67	1933
3,804	4,234	180,107	14,478	10	381,516	[K]	4,095	12,556	.....	41	908,065	904,825	1.00	1934
4,236	4,082	185,288	15 810	[K]	392,666	[K]	3,902	13,755	.....	65	996,596	961,440	96	1935
4 663	3,847	206,555	17,070	[K]	427,411	[K]	3,847	14,582	.....	63	1,099,687	1,199,820	1 09	1936
5,478	3,559	228,839	19,189	[K]	510,318	[K]	3,845	19,166	.....	77	1,279,160	1,513,340	1 18	1937
5,045	3,298	174,994	17 426	[K]	475,850	[K]	3,684	19,022	.....	82	1,214,355	1,373,060	1.13	1938
5,098	3,156	159,913	17,382	50	483,528	4	3,580	21,454	.....	.....	1,264,962	1,294,470	1.02	1939
4,999	3,159	156,164	17,353	24	493,209	3	3,444	25,711	.....	.....	1,353,214	1,385,440	1.02	1940
5,185	3,510	154,702	16,750	12	505,572	4	3,433	29,878	.....	.....	1,402,228	1,602,000	1.14	1941
5,421	3,543	140,690	17,779	9	483,097	.....	3,574	32,812	.....	.....	1,386,645	1,643,470	1.19	1942
5,059	3,322	123,152	15,757	10	594,343	.....	3,349	34,253	.....	2	1,505,613	1,809,020	1.20	1943
4,697	2,937	124,616	14,118	12	748,122	.....	3,070	32,388	.....	.....	1,677,753	2,046,859	1.22	1944
4,618	2,828	138,036	12,515	12	755,533	.....	2,879	35,359	.....	.....	1,711,103	2,087,546	1.22	1945
4,899	2,938	135,122	13,067	11	758,858	.....	2,947	38,262	.....	3	1,731,889	2,453,482	1.42	.....[P] 1946
159,096	607,455	5,648,796	1,076,644	469	10,425,332	11	430,022	703,930	.....	577	33,221,649	39,785,756	1.20	Total

[F] New York included with Pennsylvania.

[G] Tennessee included with Kentucky, 1876-1907, inclusive.

[H] Less than 500 barrels.

[I] Figures for Oklahoma and Kansas for years 1905-1906 shown together by *Mineral Resources;* here divided by aid of *Petroleum in the United States and Possessions,* by Arnold and Kemnitzer.

[J] Michigan shown with Missouri in 1900-1911.

[K] Included under "Unclassified."

[L] Kentucky and Tennessee figures in years 1916-18 obtained with aid of *Mineral Resources* and *Petroleum in the United States and Possessions,* by Arnold and Kemnitzer.

[M] Insignificant production of Utah (mostly used as fuel) shown with Wyoming.

[N] Little production but no record available.

[O] Figures on average price per barrel for years 1859-1875 taken from *Petroleum in the United States and Possessions,* by Arnold and Kemnitzer; remainder from *Mineral Resources* and *Minerals Yearbook* except 1943, 1944, and 1945 estimated.

[P] Bureau of Mines figures for first 10 months; November and December estimated by The Oil Weekly, with aid of weekly reports of American Petroleum Institute and other sources.

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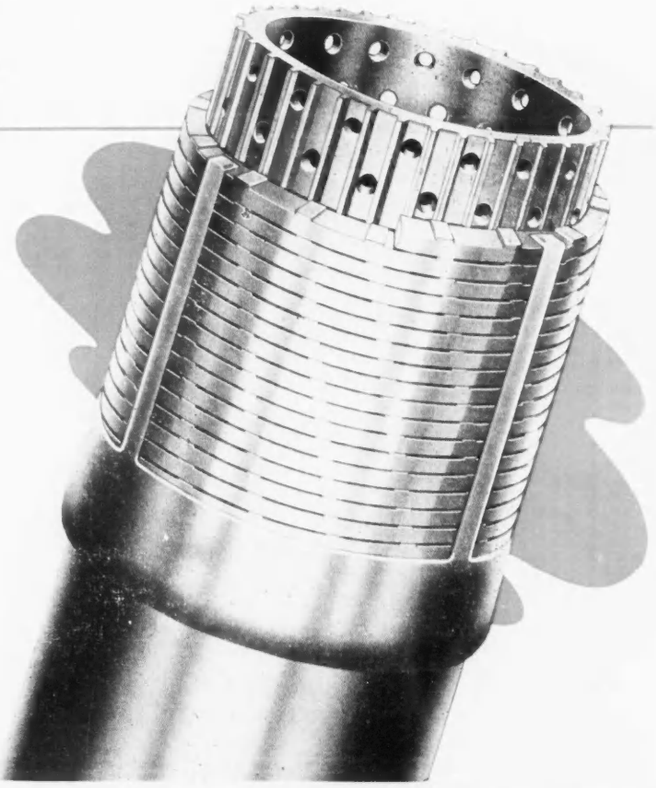

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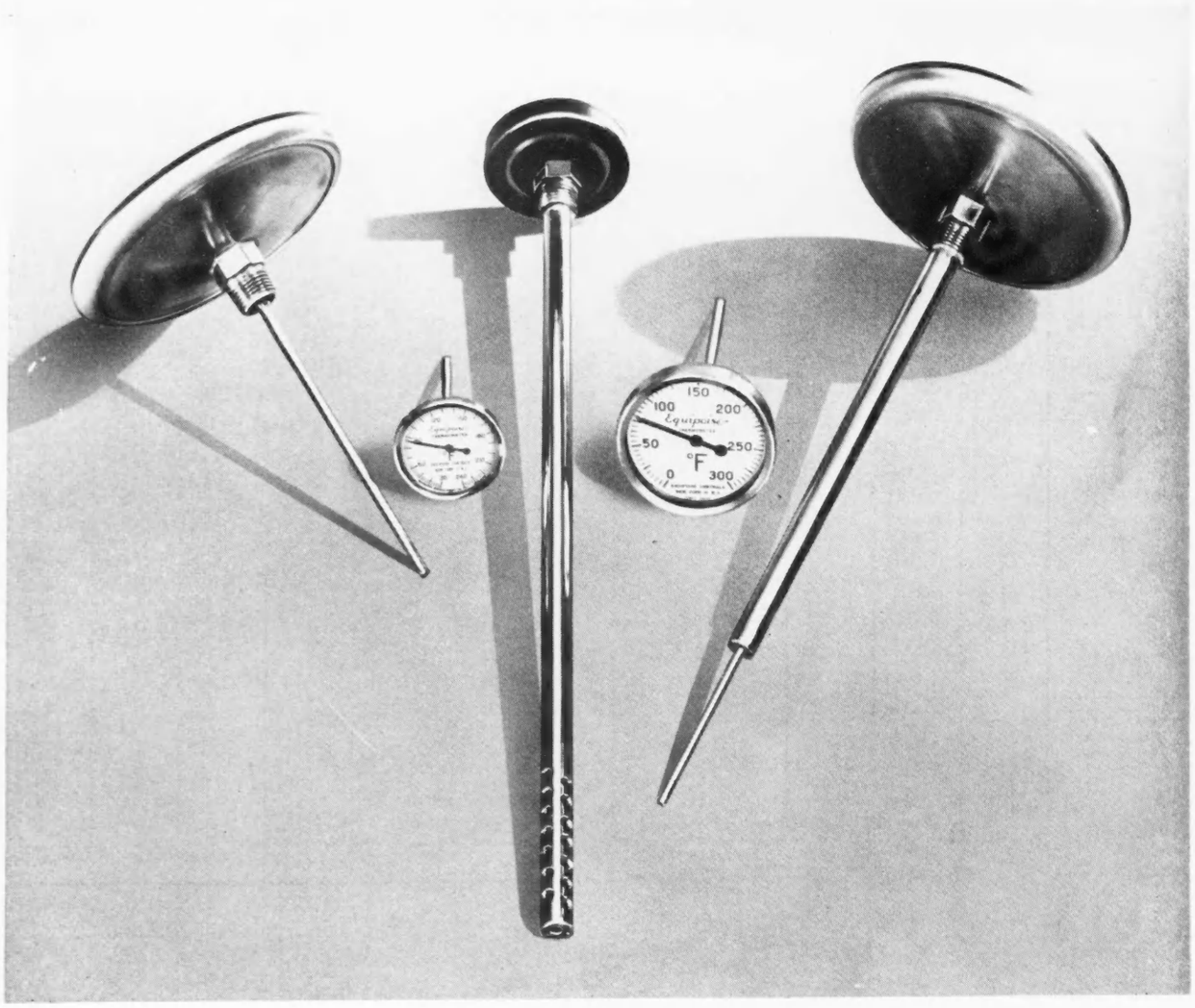
UNITED STATES—Natural Gas Marketed Production

Sources: U. S. Bureau of Mines, except for some figures for early years which are from "Petroleum in the United States and Possessions" by Ralph Arnold and William J. Kemnitzer, and except where otherwise indicated by footnotes. (SHOWN IN MILLIONS OF CUBIC FEET.)

YEAR	Arkansas	California	Colorado	Illinois	Indiana	Kansas	Kentucky	Louisiana	Michigan	Mississippi	Montana	New Mexico
•Pre-1906	281	9,810	631	1,505	471,800	81,865	13,243	31	.....	.....	.....	.....
1906	21	153	23	410	7,861	69,323	789	39	.....	.....	.....	.....
1907	•570	230	57	1,155	6,624	76,707	1,303	88	.....	.....	.....	.....
1908	•1,208	479	50	4,979	5,256	80,740	1,430	252	.....	.....	.....	.....
1909	•1,778	2,324	•45	8,473	6,159	75,074	2,097	1,365	1	.....	.....	.....
1910	•2,412	2,764	•40	6,723	5,760	59,380	1,357	4,110	1	.....	.....	.....
1911	•1,994	6,390	•35	6,762	4,365	38,800	1,275	9,786	2	.....	.....	.....
1912	•1,465	9,355	•30	5,603	3,618	28,068	1,951	14,493	2	.....	.....	.....
1913	•806	11,035	•27	4,767	2,921	22,884	1,821	26,653	2	.....	.....	.....
1914	•633	17,829	•24	3,548	2,580	22,628	1,422	26,775	2	.....	.....	.....
1915	992	21,891	•21	2,690	2,261	27,046	1,667	25,540	2	.....	6	.....
1916	2,388	31,643	•18	3,534	1,715	31,710	2,107	32,081	1	.....	213	.....
1917	5,610	49,427	•14	4,439	1,712	24,439	2,802	31,287	1	.....	334	.....
1918	5,295	39,719	10	4,473	1,667	27,825	3,022	36,094	1	.....	177	.....
1919	5,587	55,607	10	3,825	1,407	16,150	2,057	47,062	1	.....	858	.....
1920	9,027	66,041	8	3,013	1,779	21,158	3,345	58,274	.....	.....	818	.....
1921	4,260	75,942	4	2,646	1,066	15,717	4,820	58,004	.....	.....	336	.....
1922	9,700	84,580	4	3,383	947	20,289	5,872	70,267	1	.....	486	.....
1923	24,215	131,434	1	4,049	880	30,913	11,953	112,031	1	.....	1,470	.....
1924	36,616	189,692	48	4,072	998	25,580	12,875	160,945	1	.....	1,071	.....
1925	41,878	187,789	574	4,165	1,168	26,917	10,770	152,620	.....	.....	1,496	.....
1926	43,566	204,915	554	3,808	901	38,095	10,410	157,423	.....	.....	2,283	921
1927	30,450	212,364	1,725	3,741	1,124	42,646	10,206	186,961	1	.....	4,253	1,019
1928	20,235	246,215	2,931	3,051	1,290	45,644	15,383	227,821	469	.....	6,277	838
1929	19,928	342,214	2,787	2,983	1,012	38,469	27,588	261,138	4,526	90	9,659	3,054
1930	18,585	334,789	3,312	2,890	1,217	37,630	28,023	278,341	2,075	179	10,060	9,497
1931	13,300	305,930	2,536	2,130	1,337	38,742	27,870	224,155	472	6,048	10,949	19,354
1932	10,235	263,484	2,547	1,769	1,349	40,690	29,005	201,561	968	8,648	13,295	17,604
1933	8,288	259,799	2,449	1,631	1,544	41,596	31,380	197,826	1,528	8,679	14,391	19,148
1934	7,024	268,122	2,633	1,868	1,802	46,909	33,124	225,713	2,789	8,245	14,971	24,075
1935	6,167	284,109	2,843	1,448	1,777	57,125	39,738	249,450	4,203	9,643	19,870	27,931
1936	8,500	320,406	3,687	865	2,241	69,178	43,903	290,151	7,167	11,821	23,003	33,928
1937	9,690	329,769	3,186	1,040	1,551	83,890	55,719	315,301	9,080	13,348	24,765	46,337
1938	11,301	315,168	1,904	1,169	1,299	75,203	46,163	283,899	10,165	13,656	21,216	50,706
1939	10,107	348,361	2,015	2,746	791	80,556	47,771	294,370	10,726	14,527	23,178	60,284
1940	14,379	351,950	2,533	8,359	1,137	90,003	53,056	343,191	12,648	6,365	26,231	63,990
1941	19,148	374,905	3,256	10,053	1,522	111,121	69,067	403,855	13,916	4,268	28,499	64,655
1942	19,456	403,968	4,865	14,484	1,599	112,921	80,089	447,686	15,521	2,082	31,475	78,164
1943	36,469	457,757	6,445	18,120	1,450	133,729	92,364	505,294	18,006	1,461	31,562	86,500
1944	n. a.	p530,000	n. a.	n. a.	n. a.	n. a.	n. a.	p615,000	n. a.	n. a.	n. a.	n. a.
1945	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
1946	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
Total	463,564	7,148,359	53,882	166,369	557,487	2,007,360	828,837	6,576,933	142,279	109,060	323,202	608,005

	New York	Ohio	Oklahoma	Pennsylvania	Texas	West Virginia	Wyoming	Others	Total United States	VALUE AT POINTS OF CONSUMPTION: Total (Thousands of Dollars)	VALUE AT POINTS OF CONSUMPTION: Average Per M Cubic Ft. (Cts.)
•Pre-1906	31,340	305,593	2,215	1,611,066	815	387,799	506	43,281	**2,961,781**	$426,448	14.4
1906	2,548	45,436	3,520	138,161	•1,000	119,400	•100	59	**388,843**	46,874	12.1
1907	3,288	52,041	4,867	135,516	•1,200	122,687	•140	149	**406,622**	54,222	13.3
1908	3,843	47,442	11,925	130,476	•1,500	112,181	•180	200	**402,141**	54,640	13.6
1909	4,696	53,223	28,037	127,697	•3,000	166,435	•220	82	**480,706**	63,207	13.1
1910	6,010	48,232	50,430	126,867	•4,000	190,706	•253	109	**509,155**	70,756	13.9
1911	5,340	49,450	67,276	108,869	5,503	206,891	•265	90	**512,993**	74,622	14.5
1912	8,626	56,210	73,799	112,150	7,470	239,007	•247	109	**562,203**	84,564	15.0
1913	8,515	50,612	75,018	118,860	12,160	245,454	•273	90	**581,898**	87,847	15.1
1914	8,935	68,270	78,167	110,745	13,434	236,489	•306	80	**591,867**	94,116	15.9
1915	7,977	79,510	87,517	113,692	13,324	244,004	•321	118	**628,579**	101,312	16.1
1916	8,036	69,888	123,517	130,484	15,810	299,319	•557	149	**753,170**	120,227	16.0
1917	8,372	68,917	137,384	133,397	17,047	308,617	•1,209	102	**795,110**	142,089	17.9
1918	8,461	61,261	124,317	123,813	13,440	265,161	4,339	1,926	**721,001**	153,554	21.3
1919	8,124	63,153	163,649	113,489	24,710	234,095	6,014	118	**745,916**	160,888	21.6
1920	8,419	58,938	154,467	125,787	37,063	239,719	10,312	42	**798,210**	196,194	24.6
1921	6,583	47,412	124,058	86,144	44,504	174,921	15,608	27	**662,052**	174,617	26.4
1922	6,947	51,481	140,631	101,276	47,945	195,288	23,427	22	**762,546**	221,535	29.1
1923	6,497	53,812	203,082	112,562	74,535	203,867	35,523	151	**1,006,976**	240,001	23.8
1924	6,196	47,396	214,452	105,863	107,247	182,285	46,036	148	**1,141,521**	253,856	22.2
1925	6,210	43,235	249,285	101,632	134,872	180,345	45,539	76	**1,188,571**	265,271	22.3
1926	7,027	47,363	286,421	107,089	175,392	180,223	46,567	61	**1,313,019**	300,168	22.9
1927	5,908	51,381	326,864	105,709	254,063	162,375	43,582	1,056	**1,445,428**	317,930	22.0
1928	7,224	56,341	320,861	99,466	301,990	163,018	47,490	1,595	**1,568,139**	363,726	23.2
1929	8,387	57,936	357,893	101,951	464,928	167,333	44,648	1,169	**1,917,693**	413,276	21.6
1930	9,624	63,394	348,116	88,706	517,880	144,180	43,219	1,704	**1,943,421**	416,090	21.4
1931	7,868	56,326	263,685	74,797	464,580	124,797	39,770	1,790	**1,686,436**	392,816	23.3
1932	8,813	51,466	255,487	61,611	456,832	100,540	28,938	1,148	**1,555,990**	384,632	24.7
1933	6,865	47,929	245,759	63,579	475,691	103,653	25,830	909	**1,555,474**	368,540	23.7
1934	6,278	50,330	254,457	86,238	602,976	109,161	23,148	858	**1,770,721**	395,378	22.3
1935	8,288	49,592	274,313	94,464	642,366	115,772	26,643	853	**1,916,595**	428,074	22.4
1936	12,431	46,994	280,481	110,362	734,561	138,076	29,322	725	**2,167,802**	475,439	22.0
1937	21,325	42,783	296,260	115,928	854,561	149,084	31,023	2,980	**2,407,620**	527,529	21.9
1938	39,402	35,257	263,164	76,547	882,473	134,342	26,678	5,850	**2,295,562**	500,550	21.8
1939	29,292	36,469	250,875	93,882	979,427	159,226	26,614	5,699	**2,476,756**	533,721	21.6
1940	12,187	40,639	257,626	90,725	1,063,538	188,751	27,346	5,568	**2,660,222**	577,004	21.7
1941	10,456	41,858	234,054	92,819	1,086,312	207,681	29,284	5,929	**2,812,658**	620,038	22.1
1942	8,718	45,055	269,704	93,532	1,170,345	215,193	33,124	5,494	**3,053,475**	691,167	22.7
1943	8,062	52,001	285,045	93,543	1,323,885	223,787	34,351	4,858	**3,414,689**	758,937	22.3
1944	n. a.	n. a.	p315,000	n. a.	p1,460,000	p200,000	n. a.	p660,232	**p3,780,232**	821,310	21.8
1945	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	**p3,875,172**	n. a.	n. a.
1946	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	**p4,040,000**	p835,000	20.7
Total	382,948	2,294,626	7,503,678	5,619,494	14,492,379	7,538,862	798,952	715,517	**66,558,965**	.....	.....

• Indicates figures are estimates. p Indicates figures are preliminary and subject to revision. n. a. means not available.



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STATE OR DISTRICT	PRODUCTIVE: (In Fields, Outposts, and Wildcats) Oil 1945	Oil 1946	Gas 1945	Gas 1946	Distillate 1945	Distillate 1946	Total Productive 1945	Total Productive 1946	% Dif.	DRY HOLES In Fields 1945	In Fields 1946	Outposts 1945	Outposts 1946	Wildcats 1945	Wildcats 1946	Total Dry 1945	Total Dry 1946	% Diff.	Total New For Oil or Gas 1945	Total New For Oil or Gas 1946	% Diff.
Alabama	14	3	1				15	3	— 80.0	2	1			21	13	23	14	— 39.1	38	17	— 55.3
Arizona														3	2	3	2	— 33.3	3	2	— 33.3
Arkansas	118	106	5	5	2	3	125	114	— 8.8	31	31	1	1	41	55	73	87	+ 19.2	198	201	+ 1.5
California	1,699	1,447	45	56	2		1,746	1,503	— 13.9	50	66	2		280	254	332	320	— 3.6	2,078	1,823	— 12.3
Colorado	39	157	3	2			42	159	+278.6		3		1	11	13	11	17	+ 54.5	53	176	+232.1
Florida	1	2					1	2	+100.0	1	1			13	24	14	25	+ 78.6	15	27	+ 80.0
Georgia														6	2	6	2	— 66.7	6	2	— 66.7
Illinois	1,073	1,344		8			1,073	1,352	+ 26.0	302	445			386	543	688	988	+ 43.6	1,761	2,340	+ 32.9
Indiana	118	276	28	26			146	302	+106.8	89	118			87	92	176	210	— 19.3	322	512	+ 59.0
Iowa														1		1		—100.0	1		—100.0
Kansas	811	1,130	181	306			992	1,436	+ 44.8	361	400			317	269	678	669	— 1.3	1,670	2,105	+ 26.0
Kentucky	331	325	231	226			562	551	— 2.0	62	217			90	84	152	301	+ 98.0	714	852	+ 19.3
Louisiana	599	774	82	100	46	72	727	946	+ 30.1	217	256	3	3	132	208	352	467	+ 32.7	1,079	1,413	+ 31.0
North Louisiana	213	441	70	93	13	24	296	558	+ 88.5	76	122	2	2	82	123	160	247	+ 48.8	456	805	+ 76.5
South Louisiana	386	333	12	7	33	48	431	388	+ 10.0	141	134	1	1	50	85	192	220	+ 14.6	623	608	+ 2.4
Maryland														1	1	1	1		1	1	
Michigan	291	238	49	94		1	340	333	— 2.1	176	207	9	2	234	227	419	436	+ 4.1	759	769	+ 1.3
Mississippi	191	141	3	16	8	3	202	160	— 20.8	45	24			121	79	166	103	— 38.0	368	263	— 28.5
Missouri	4	7	10	4			14	11	— 21.4	10				20	23	30	23	— 23.3	44	34	— 22.7
Montana	232	151	49	20			281	171	— 39.1	57	60		3	16	19	73	82	+ 12.3	354	253	— 28.5
Nebraska														7	5	7	5	— 28.6	7	5	— 28.6
New Mexico	277	308	15	43			292	351	+ 20.2	65	43	1		65	48	131	91	— 30.5	423	442	+ 4.5
New York	723	719	7	9			730	728	— 0.3		17	6		11	1	17	18	+ 5.9	747	746	— 0.1
North Carolina														1	5	1	5	+400.0	1	5	+400.0
North Dakota			7				7		—100.0										7		—100.0
Ohio	248	365	352	537			600	902	+ 50.3	349	365			66	45	415	410	— 1.2	1,015	1,312	+ 29.3
Oklahoma	1,370	1,798	125	216	2	3	1,497	2,017	+ 34.7	464	688			299	414	763	1,102	+ 44.4	2,260	3,119	+ 38.0
Oregon														1	2	1	2	+100.0	1	2	+100.0
Pennsylvania	1,547	1,583	588	611			2,135	2,194	+ 2.8	146	226	51	1	7	2	204	229	+ 12.3	2,339	2,423	+ 3.6
South Dakota														3	3	3	3		3	3	
Tennessee														6	2	6	2	— 66.7	6	2	— 66.7
Texas	4,025	4,870	699	471	93	124	4,817	5,465	+ 13.5	1,203	1,335	17	48	1,203	1,326	2,423	2,709	+ 11.8	7,240	8,174	+ 12.9
East Texas Border Co.'s	2	42	92	128	10	3	104	173	+ 66.3	5	9			19	12	24	21	— 12.5	128	194	+ 51.6
Rest of Eastern Texas	145	359	13	19	3	2	161	380	+136.0	34	54	2		66	81	102	135	+ 32.4	263	515	+ 95.8
North Texas	967	1,210	15	15			982	1,225	+ 24.7	507	633	2	4	305	366	814	1,003	+ 23.2	1,796	2,228	+ 24.1
West Central Texas	199	258	48	31			247	289	+ 17.0	101	175		2	123	179	224	356	+ 58.9	471	645	+ 36.9
West Texas	1,289	1,519	24	17			1,313	1,536	+ 17.0	167	130	8	20	192	137	367	287	— 21.8	1,680	1,823	+ 8.5
Texas Panhandle	179	160	341	131			520	291	— 44.0	32	34			9	12	41	46	+ 12.2	561	337	— 39.9
Gulf Coast, Upper	353	346	43	28	41	45	437	419	— 4.1	124	117	3	3	141	138	268	258	— 3.7	705	677	— 4.0
Gulf Coast, Lower	645	751	88	69	37	63	770	883	+ 14.7	120	80		13	178	155	298	248	— 16.8	1,068	1,131	+ 5.9
Southwest Texas	220	161	32	30	2	9	254	200	— 21.3	101	87	1	4	118	150	220	241	+ 9.1	474	441	— 7.0
South Central Texas	26	64	3	3		2	29	69	+138.0	12	16	1	2	52	96	65	114	+ 75.4	94	183	+ 94.7
Utah		1	2				2	1	— 50.0					2	4	2	4	+100.0	4	5	+ 25.0
Virginia														1	2	1	2	+100.0	1	2	+100.0
Washington														4	1	4	1	— 75.0	4	1	— 75.0
West Virginia	86	101	552	541			638	642	+ 0.6	108	129	15	1	6	9	129	139	+ 7.8	767	781	+ 1.8
Wyoming	147	116	5	12		1	152	129	— 15.1	14	14	3	2	24	18	41	34	— 17.1	193	163	— 15.5
Total United States	13,994	15,962	3,039	3,303	153	207	17,186	19,472	+ 13.6	3,752	4,646	108	62	3,486	3,795	7,346	8,503	+ 15.8	24,482	27,975	+ 14.3

STATE OR DISTRICT	OTHER NEW WELLS Water Input 1945	Water Input 1946	Gas Input 1945	Gas Input 1946	Salt Water Disposal 1945	Salt Water Disposal 1946	TOTAL NEW WELLS 1945	TOTAL NEW WELLS 1946	% Diff.	OLD WELLS DRILLED DEEPER Oil 1945	Oil 1946	Gas 1945	Gas 1946	Dry 1945	Dry 1946	Total 1945	Total 1946	% Diff.	TOTAL ALL WELLS 1945	TOTAL ALL WELLS 1946	% Diff.
Alabama							38	17	— 55.3										38	17	— 55.3
Arizona							3	2	— 33.3										3	2	— 33.3
Arkansas							198	201	+ 1.5	2	2					2	2		200	203	+ 1.5
California							2,078	1,823	— 12.3	11	72		1	1	1	12	74	+ 516.7	2,090	1,897	— 9.2
Colorado							53	176	+232.1										53	176	+232.1
Florida							15	27	+ 80.0										15	27	+ 80.0
Georgia							6	2	— 66.7										6	2	— 66.7
Illinois	2	1	1		14	1	1,778	2,342	+ 31.7	118	29			12	8	130	37	— 71.5	1,908	2,379	+ 24.7
Indiana							322	512	+ 59.0	7	5	1		2	5	10	10		332	522	+ 57.2
Iowa							1		—100.0										1		—100.0
Kansas					13	22	1,683	2,127	+ 26.4	40	61			34	33	74	94	+ 27.0	1,757	2,221	+ 26.4
Kentucky	1					1	715	853	+ 19.3	5	2		2	2	4	7	8	+ 14.3	722	861	+ 19.3
Louisiana	1			3	1	2	1,081	1,418	+ 31.2	4			1	2	3	6	4	— 33.3	1,087	1,422	+ 30.8
North Louisiana				1	1	1	457	807	+ 76.6	1			1	1	2	2	3	+ 50.0	459	810	+ 76.5
South Louisiana	1			2		1	624	611	— 2.1	3				1	1	4	1	— 75.0	628	612	— 2.5
Maryland							1	1											1	1	
Michigan			2	12			761	781	+ 2.6	1				1	4	2	4	+100.0	763	785	+ 2.6
Mississippi							368	263	— 28.5	1	3					1	3	+200.0	369	266	— 27.9
Missouri							44	34	— 22.7					4		4		—100.0	48	34	— 29.2
Montana		5					354	258	— 27.1		5						5		354	263	— 25.7
Nebraska							7	5	— 28.6										7	5	— 28.6
New Mexico							422	442	+ 4.5	1	18			1	3	2	21	+950.0	425	463	+ 8.9
New York	408	406					1,155	1,152	— 0.3				1				1		1,155	1,153	— 0.2
North Carolina							1	5	+400.0										1	5	+400.0
North Dakota							7		—100.0										7		—100.0
Ohio	5		1	1			1,021	1,313	+ 28.6		2		6	2	5	2	13	+550.0	1,023	1,326	+ 29.6
Oklahoma	5		22	46	9	14	2,296	3,179	+ 38.5	36	72	5	11	14	39	55	122	+121.8	2,351	3,301	+ 40.4
Oregon							1	2	+100.0										1	2	+100.0
Pennsylvania	1,360	1,392	283	288			3,982	4,103	+ 3.0	1	3	16	24	1	13	18	40	+122.2	4,000	4,143	+ 3.6
South Dakota							3	3											3	3	
Tennessee							6	2	— 66.7										6	2	— 66.7
Texas	14	12	19	30	5	10	7,278	8,226	+ 13.0	95	116	7	6	29	34	131	156	+ 19.1	7,409	8,382	+ 13.1
East Texas Border Co.'s							128	194	+ 51.6										128	194	+ 51.6
Rest of Eastern Texas				1		4	263	520	+ 97.7	3	2		2	2		5	4	— 20.0	268	524	+ 95.5
North Texas	13	8	17	20	4	5	1,830	2,261	+ 23.6	12	17			8	13	20	30	+ 50.0	1,850	2,291	+ 23.8
West Central Texas		1		1			471	647	+ 37.4	5	10	2	1	4	9	11	20	+ 81.8	482	667	+ 38.4
West Texas		1		1			1,680	1,825	+ 8.6	42	43			10	2	52	45	— 13.5	1,732	1,870	+ 8.0
Texas Panhandle		1		2			561	340	— 39.4	22	27	2		3	1	27	28	+ 3.7	588	368	— 37.4
Gulf Coast, Upper	1			2		1	706	680	— 3.7	5		1		1		7		—100.0	713	680	— 4.6
Gulf Coast, Lower			2	2			1,070	1,133	+ 5.9	4	13	2	1	1	8	7	22	+214.3	1,077	1,155	+ 7.2
Southwest Texas		1		1			474	443	— 6.5	2	4		2		1	2	7	+250.0	476	450	— 5.5
South Central Texas					1		95	183	+ 92.6										95	183	+ 92.6
Utah							4	5	+ 25.0										4	5	+ 25.0
Virginia							1	2	+100.0										1	2	+100.0
Washington							4	1	— 75.0										4	1	— 75.0
West Virginia			1				768	781	+ 1.7	3	5	30	18	2	2	35	25	— 28.6	803	806	+ 0.4
Wyoming							193	163	— 15.5										193	163	— 15.5
Total United States	1,796	1,816	329	380	42	50	26,649	30,221	+ 13.4	325	395	50	70	107	154	491	619	+ 26.1	27,140	30,840	+ 13.6

NEW...

all-forged

WELL HEAD EQUIPMENT

by DE LANEY

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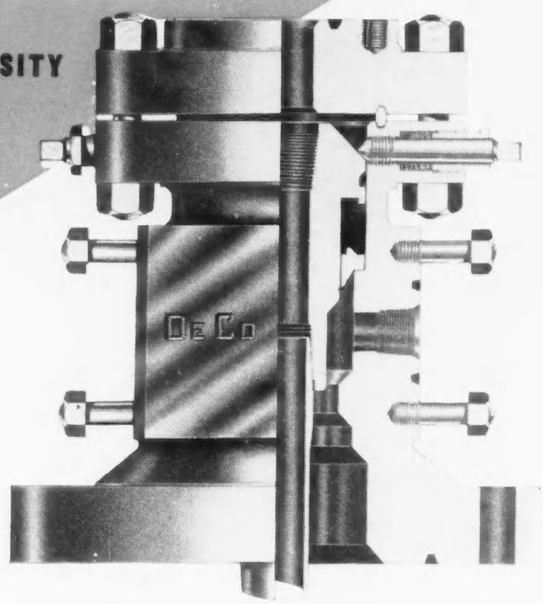

New developments in forging practices have made possible the manufacture of a complete line of new, all-forged steel well head equipment, being produced under the trade name of "Deco." The new line includes parts for Christmas trees of various types, all standard sizes, and in a wide range of pressure ratings. Designed and manufactured to meet API specifications covering well head equipment, this line includes four types of casing heads and three types of tubing heads.

Tubing hangers feature a special "O" ring in addition to regular packing elements to provide positive sealing action. Both casing and tubing hangers are equipped with "Hycar" impregnated packing glands.

This new line of well head equipment is available in pressure ratings from Series 600 (4,000 pounds test pressure) to Series 2500 (15,000 pounds test pressure). Other forged parts include adapter flanges and hydraulic square-cut forged fittings.

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DE CO

WELL HEAD EQUIPMENT

- ★ Casing heads, tubing heads and fittings.
- ★ All sizes and styles.
- ★ All pressure ranges.
- ★ Forged steel throughout.
- ★ Meets API specifications.
- ★ A complete Christmas tree for any specification to assure safe completion of any well.

THE DELANEY CO.

6119 East Montgomery • Houston 9, Texas

Telephone M-3-3633

UNITED STATES—Footage, Average Depths

STATE OR DISTRICT	OIL			GAS			DISTILLATE			DRY			WATER INPUT			GAS INPUT		
	Wells	Footage	Average Depth	Wells	Footage	Average Depth	Wells	Footage	Average Depth	Wells	Footage	Average Depth	Wells	Footage	Average Depth	Wells	Footage	Average Depth
Alabama	3	9,853	3284							14	59,528	4252						
Arizona										2	6,259	3130						
Arkansas	106	437,327	4116	5	19,633	3927	3	22,226	7409	87	315,656	3640						
California	1447	6,088,841	3208	56	238,848	4265				320	1,435,557	4486						
Colorado	157	1,011,010	6440	2	15,553	7777				17	88,940	5232						
Florida	2	23,154	11577							25	155,224	6209						
Georgia										2	8,441	4221						
Illinois	1344	3,407,496	2535	8	9,408	1176				988	2,516,064	2547	1	1,573	1573			
Indiana	276	493,408	1788	26	25,829	933				210	393,583	1898						
Iowa																		
Kansas	1130	3,657,496	3237	306	878,733	2872				669	2,291,955	3426						
Kentucky	325	528,573	1626	226	462,361	2046				301	506,694	1683						
Louisiana	774	4,468,758	5774	100	480,497	4805	72	671,527	9327	467	3,085,411	6607				3	28,978	9659
North Louisiana	441	1,579,502	3582	93	406,245	4368	24	180,832	7535	247	1,064,335	4309				1	8,255	8255
South Louisiana	333	2,889,256	8676	7	74,252	10607	48	490,695	10223	220	2,021,076	9187				2	20,723	10362
Maryland										1	7,710	7710						
Michigan	238	619,419	2603	94	140,414	1494	1	5,037	5037	436	972,906	2231				12	15,815	1318
Mississippi	141	1,077,773	7644	16	139,340	8709	3	29,036	9679	103	706,832	6862						
Missouri	7	1,808	258	4	1,431	358				23	24,328	1058						
Montana	151	351,129	2325	20	46,230	2312				82	214,982	2622	5	10,092	2018			
Nebraska										5	12,799	2560						
New Mexico	308	1,276,432	4144	43	113,966	2650				91	332,791	3657						
New York	719	970,931	1350	9	34,480	3831				18	73,100	4061	406	542,388	1336			
North Carolina										5	26,173	5235						
North Dakota																		
Ohio	365	843,195	2310	537	1,534,290	2857				410	1,017,738	2482				1	3,370	3370
Oklahoma	1798	5,923,462	3294	216	723,874	3351	3	24,159	8053	1102	3,385,674	3072				46	75,439	1640
Oregon										2	17,148	8574						
Pennsylvania	1583	2,553,138	1613	611	1,273,108	2084				229	488,656	2134	1392	2,227,200	1600	228	460,800	1600
South Dakota										3	8,038	2679						
Tennessee										2	1,618	1618						
Texas	4870	22,221,654	4563	471	2,295,623	4874	124	928,390	7487	2709	10,273,191	3792	12	20,432	1703	30	78,653	2622
E. Texas Border Co.'s	42	155,343	3699	128	827,224	6463	3	19,608	6536	21	129,397	6162						
Rest of East Texas	359	1,836,732	5116	19	109,075	5741	2	15,020	7510	135	695,902	5155				1	5,861	5861
North Texas	1210	3,399,452	2809	15	52,115	3474				1003	2,386,857	2380	8	8,486	1048	20	31,376	1569
West Central Texas	258	658,228	2551	31	81,034	2614				356	985,069	2767	1	1,638	1638	1	1,970	1970
West Texas	1519	7,641,188	5030	17	49,796	2929				287	1,346,648	4692	1	2,988	2988	1	2,953	2953
Texas Panhandle	160	483,716	3023	131	393,312	3002				46	150,692	3276	1	6,145	6145	2	6,599	3300
Gulf Coast, Upper	346	2,398,943	6933	28	190,047	6787	45	426,601	9480	258	1,871,615	7254				2	14,510	7255
Gulf Coast, Lower	751	4,789,842	6378	69	482,395	6991	63	416,217	6607	248	1,542,904	6221				2	10,096	5048
Southwest Texas	161	581,391	3611	30	100,617	3354	9	37,546	4172	241	796,419	3305	1	1,275	1275	1	5,288	5288
South Central Texas	64	276,819	4325	3	10,008	3336	2	13,398	6699	114	367,688	3225						
Utah	1	1,215	1215							4	13,114	3279						
Virginia										2	5,370	2686						
Washington										1	6,230	6230						
West Virginia	101	190,055	1882	541	1,607,631	2972				139	380,220	2735						
Wyoming	116	477,315	4115	12	66,434	5536	1	12,895	12895	34	122,146	3593						
Total United States	15,962	56,632,442	3548	3303	10,107,-683	3060	207	1,693,270	8180	8503	28,960,076	15558	1816	2,801,685	1543	380	663,055	1745

STATE OR DIST.	SALT WATER DISPOSAL			TOTAL NEW WELLS (Preceding Classes)						OLD WELLS DRILLED DEEPER 1946 (Productive and Dry)			TOTAL ALL WELLS					
				1946			1945						1946			1945		
	Wells	Footage	Average Depth	Wells	Footage	Average Depth	Wells	Footage	Average Depth	Wells	Footage	Average Depth	Wells	Footage	Average Depth	Wells	Footage	Average Depth
Alabama				17	69,381	4081	38	151,088	3976				17	69,381	4081	38	151,088	3976
Arizona				2	6,259	3130	3	7,190	2397				2	6,259	3130	3	7,190	2397
Arkansas				201	794,842	3954	198	864,651	4367	2	170	85	203	795,012	3916	200	864,831	4324
California				1823	7,763,246	4259	2078	8,592,398	4135	74	96,879	1309	1897	7,860,125	4143	2090	8,599,049	4114
Colorado				176	1,115,503	6338	53	323,492	6104				176	1,115,503	6338	53	323,492	6104
Florida				27	178,378	6607	15	98,395	6560				27	178,378	6607	15	98,395	6560
Georgia				2	8,441	4221	6	19,502	3250				2	8,441	4221	6	19,502	3250
Illinois	1	2,135	2135	2342	5,936,076	2535	1778	4,601,038	2588	37	11,903	322	2379	5,948,579	2500	1908	4,617,600	2420
Indiana				512	917,820	1793	322	512,970	1593	10	5,016	502	522	922,836	1768	332	515,551	1553
Iowa							1	1,250	1250							1	1,250	1250
Kansas	22	72,262	3285	2127	6,900,446	3244	1683	5,516,879	3278	94	19,492	207	2221	6,919,938	3116	1757	5,533,962	3150
Kentucky	1	2,290	2290	853	1,499,918	1758	715	1,360,173	1902	8	2,860	350	861	1,502,778	1745	722	1,360,971	1885
Louisiana	2	20,108	10054	1418	8,755,279	6174	1081	7,791,075	7207	4	7,389	1847	1422	8,762,668	6162	1087	7,798,605	7430
North Louisiana	1	8,178	8178	807	3,247,347	4024	457	2,094,342	4583	3	5,439	1813	810	3,252,786	4016	459	2,097,495	4570
South Louisiana	1	11,930	11930	611	5,507,932	9015	624	5,696,733	9129	1	1,950	1950	612	5,509,882	9003	628	5,701,110	9078
Maryland				1	7,710	7710	1	7,178	7178				1	7,710	7710	1	7,178	7178
Michigan				781	1,753,591	2245	761	1,968,757	2587	4	3,127	782	785	1,756,718	2238	763	1,970,173	2582
Mississippi				263	1,952,981	7426	368	2,440,715	6632	3	921	307	266	1,953,902	7346	369	2,440,887	6615
Missouri				34	27,567	811	44	48,894	1111				34	27,567	811	48	50,064	1043
Montana				258	622,433	2413	354	850,060	2401	5	1,235	247	263	623,668	2371	354	850,060	2401
Nebraska				5	12,799	2560	7	25,246	3607				5	12,799	2560	7	25,246	3607
New Mexico				442	1,723,189	3899	423	1,545,223	3653	21	38,371	1827	463	1,761,560	3805	425	1,546,558	3639
New York				1152	1,620,899	1407	1155	1,643,877	1423	1	3	3	1153	1,620,902	1406	1155	1,643,877	1423
North Carolina				5	26,173	5235	1	4,044	4044				5	26,173	5235	1	4,044	4044
North Dakota							7	9,700	1386							7	9,700	1386
Ohio				1313	3,398,593	2588	1021	2,581,504	2528	13	8,584	660	1326	3,407,177	2570	1023	2,581,679	2524
Oklahoma	14	25,125	1795	3179	10,157,733	3195	2296	9,268,557	4037	122	44,204	362	3301	10,201,937	3091	2351	9,290,920	3952
Oregon				2	17,148	8574	1	5,924	5924				2	17,148	8574	1	5,924	5924
Pennsylvania				4013	7,002,902	1707	3982	7,124,754	1789	40	41,053	1026	4143	7,043,955	1700	4000	7,139,363	1785
South Dakota				3	8,038	2679	3	7,503	2501				3	8,038	2679	3	7,503	2501
Tennessee				2	1,618	809	6	10,913	1819				2	1,618	809	6	10,913	1819
Texas	10	30,420	3042	8226	35,848,363	4358	7278	32,638,758	4485	156	75,251	482	8382	35,923,614	4286	7409	32,696,651	4413
E. Tex. Bor. Co.'s				194	1,131,572	5833	128	827,434	6464				194	1,131,572	5833	128	827,434	6464
Rest of East Texas	4	16,089	4022	520	2,678,679	5151	263	1,589,668	6044	4	5,088	1272	524	2,683,767	5122	268	1,595,817	5955
North Texas	5	5,146	1029	2261	5,883,332	2602	1830	4,551,718	2487	30	16,111	537	2291	5,899,443	2575	1850	4,565,272	2468
West Cent Texas				647	1,727,939	2671	471	1,208,298	2756	20	7,574	379	667	1,735,513	2602	482	1,305,343	2708
West Texas				1825	9,043,573	4955	1680	8,287,958	4933	45	15,182	377	1870	9,058,755	4844	1732	8,306,354	4796
Texas Panhandle				340	1,040,464	3060	561	1,774,284	3163	28	2,089	75	368	1,042,553	2883	588	1,776,791	3022
Gulf Coast, Upper	1	9,185	9185	680	4,910,901	7222	706	5,172,618	7372				680	4,910,901	7222	713	5,176,679	7260
Gulf Coast, Lower				1133	7,241,454	6391	1070	6,815,703	6370	22	27,811	1264	1155	7,269,265	6294	1077	6,821,771	6334
Southwest Texas				443	1,522,536	3437	474	1,878,811	3964	7	1,396	199	450	1,523,932	3387	476	1,878,924	3947
South Central Tex.				183	667,913	3650	95	442,266	4655				183	667,913	3650	95	442,266	4655
Utah				5	14,329	2866	4	5,080	1270				5	14,329	2866	4	5,080	1270
Virginia				2	5,370	2685	1	802	802				2	5,370	2685	1	802	802
Washington				1	6,230	6230	4	14,783	3696				1	6,230	6230	4	14,783	3696
West Virginia				781	2,177,906	2789	768	2,064,454	2688	25	12,281	491	806	2,190,187	2717	803	2,091,114	2604
Wyoming				163	678,790	4164	193	875,286	4535				163	678,790	4164	193	875,286	4535
Total U.S.	50	152,340	3047	30,221	101,010,551	3342	26,649	92,982,113	3489	619	368,739	596	30,840	101,379,290	3287	27,140	93,159,291	3433

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HOUSTON 6, TEXAS

UNITED STATES

Fields That Have Produced Over 100 Million Barrels Each

FIELD	State or District	Year Found	Barrels in 1945	Barrels in 1946	Cumulative Through 1946
No. 1. Field:					
East Texas	East Texas	1930	131,064,282	120,581,132	2,357,466,899
½-¾ Billion Barrels:					
Long Beach	California	1921	9,840,448	9,131,279	721,598,105
Midway-Sunset	California	1900	14,418,492	13,856,172	702,253,671
Oklahoma City	Oklahoma	1928	12,968,085	10,693,405	642,545,568
Coalinga	California	1900	31,798,228	29,353,780	533,293,215
Santa Fe Sp'gs.	California	1921	6,274,748	6,140,618	508,980,849
Over 400 Million Barrels:					
Bradford	Penn.-N.Y.	1871	10,792,995	11,756,285	491,935,341
Smackover	Arkansas	1922	3,812,706	4,148,025	410,909,322
300-400 Million Barrels:					
Huntington B'ch	California	1920	17,630,629	17,200,833	378,818,045
Cushing	Oklahoma	1912	2,814,150	2,791,885	373,953,649
Buena Vista	California	1909	15,771,357	14,828,713	329,771,239
Kettleman	California	1928	14,366,275	13,863,888	323,923,641
Salt Creek	Wyoming	1908	4,499,355	4,658,130	322,379,277
Wilmington	California	1937	36,340,876	40,397,904	321,845,908
Yates	West Texas	1926	13,391,050	13,555,318	315,255,855
Ventura Ave.	California	1926	17,724,974	16,873,073	308,779,731
200-300 Million Barrels:					
Kern River	California	1900	3,542,499	3,609,651	298,202,982
Glenn	Oklahoma	1905	2,359,360	2,418,490	230,722,940
Conroe	Texas Coast	1931	21,368,098	20,702,898	227,235,567
Burbank	Oklahoma	1920	3,127,685	2,926,570	220,959,449
Hendricks	West Texas	1926	1,530,184	1,393,081	210,994,021
Healdton	Oklahoma	1913	2,422,870	2,437,835	203,348,047
150-200 Million Barrels:					
Salem	Illinois	1938	6,637,160	5,966,655	198,192,510
Elk Hills	California	1919	15,809,776	3,708,412	194,764,628
Elderado	Kansas	1917	2,648,075	2,618,145	192,781,775
Brea Olinda	California	1897	4,193,505	3,967,970	189,484,373
Caddo	Louisiana	1906	1,913,330	1,897,270	173,425,970
Van	East Texas	1929	10,948,396	10,690,367	172,902,779
St. Louis	Oklahoma	1927	1,703,455	1,500,150	168,869,988

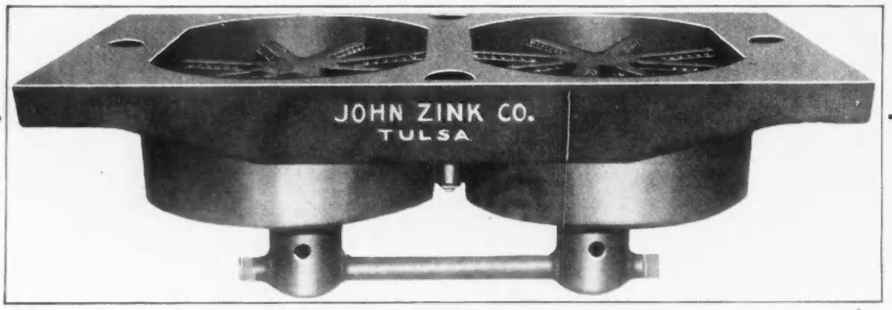
FIELD	State or District	Year Found	Barrels in 1945	Barrels in 1946	Cumulative Through 1946
150-200 Million Barrles—Con'd					
Dominguez	California	1923	6,737,605	5,872,042	167,883,868
McElroy	West Texas	1926	10,852,442	9,784,392	164,548,425
Inglewood	California	1924	5,652,823	4,713,610	156,285,353
Rodessa Total	La.-Tex.Ark.		4,178,013	3,365,163	152,994,366
Rodessa	Arkansas	1937	196,952	212,301	7,469,734
Rodessa	N. Louisiana	1935	2,527,625	2,024,655	88,284,515
Redessa	East Texas	1935	1,453,436	1,128,207	57,240,117
125-150 Million Barrels:					
Coyote, West	California	1934	5,271,152	5,565,080	149,582,847
Montebello	California	1917	3,671,322	3,127,347	146,074,063
Seminole City	Oklahoma	1926	1,339,185	1,306,700	136,919,505
Humble	Texas Coast	1904	817,897	771,924	130,758,923
Earlsboro	Oklahoma	1926	775,625	716,495	129,975,941
Louden	Illinois	1937	9,462,625	8,243,160	129,480,119
Spindletop	Texas Coast	1901	274,745	214,470	128,215,936
Bowlegs	Oklahoma	1926	1,250,490	1,168,730	126,689,726
Hastings	Texas Coast	1934	20,969,315	19,354,870	125,998,741
100-125 Million Barrels:					
Howard-Glasscock	West Texas	1926	4,910,253	4,992,694	123,760,279
Tonkawa	Oklahoma	1921	385,075	396,025	123,663,774
Wasson	West Texas	1936	22,625,154	21,299,421	123,341,618
Allegbany	New York	1879	3,494,434	3,620,770	120,342,843
Terrance	California	1922	3,249,086	3,147,882	120,241,631
Little River	Oklahoma	1927	1,212,895	1,158,875	118,970,077
Powell	East Texas	1900	450,157	440,186	117,737,885
Hobbs	New Mexico	1929	3,796,103	3,570,678	116,193,620
Richfield	California	1919	2,724,300	2,692,169	109,112,387
Big Lake	West Texas	1923	1,399,975	1,271,805	106,631,557
Seal Beach	California	1926	3,424,418	3,712,451	105,758,542
Hewitt	Oklahoma	1919	1,803,830	1,697,615	103,739,168
Fitts	Oklahoma	1933	1,700,900	1,518,400	103,733,956
Hull	Texas Coast	1918	1,448,031	1,220,574	102,251,571
McKittrick	California	1898	2,029,491	1,677,406	101,481,934
West Columbia	Texas Coast	1902	2,612,850	2,369,030	100,891,071
Mexia	East Texas	1916	479,154	467,262	100,409,478

Oil Wells and Average Output

Data represent only active crude oil producing wells, including no gas wells, no inactive or shut-in oil wells, and only several hundred condensate wells, mostly in Louisiana.

	FLOWING OIL WELLS			OIL WELLS PRODUCING BY ARTIFICIAL LIFT			TOTAL PRODUCING OIL WELLS			DAILY AVERAGE PRODUCTION PER WELL AT END OF YEAR		
	End of 1945	End of 1946	Percent Change	End of 1945	End of 1946	Percent Change	End of 1945	End of 1946	Percent Change	1945	1946	Percent Change
Alabama		1		27	26	— 3.7	27	27		25.7	35.9	+ 39.7
Arkansas	507	451	—11.0	2,766	2,836	+ 2.5	3,273	3,287	+ 0.4	31.4	23.7	— 24.5
California	1,889	1,894	+ 0.3	19,857	20,991	+ 5.7	21,746	22,885	+ 5.2	38.8	38.5	— 0.8
San Joaquin Valley	1,083	1,126	+ 4.0	11,154	11,580	+ 3.8	12,237	12,706	+ 3.8	32.6	33.3	+ 2.2
Coastal District	430	383	—10.9	1,681	2,041	+21.4	2,111	2,424	+14.8	68.1	58.5	— 14.1
Los Angeles Basin	376	385	+ 2.4	7,022	7,370	+ 5.0	7,398	7,755	+ 4.8	40.6	40.6	
Colorado	70	87	+24.3	173	293	+69.4	243	380	+56.4	91.8	93.5	+ 1.9
Florida		2		2	1	—50.0	2	3	+50.0	37.5	83.3	+122.1
Illinois	205	89	—56.6	27,710	28,907	+ 4.3	27,915	28,996	+ 3.9	7.3	7.0	— 4.1
Indiana		4		2,379	2,153	— 9.5	2,379	2,157	— 9.3	5.5	8.5	+ 54.5
Kansas	174	106	—39.1	26,518	27,139	+ 2.3	26,692	27,245	+ 2.1	9.4	10.0	+ 6.4
Kentucky		3		14,741	14,621	— 0.8	14,741	14,624	— 0.8	2.1	2.0	— 4.8
Louisiana	3,343	3,276	— 2.0	4,467	4,819	+ 7.9	7,810	8,095	+ 3.6	47.6	51.6	+ 8.4
North Louisiana	840	820	— 2.4	3,489	3,757	+ 7.7	4,329	4,577	+ 5.7	17.7	21.7	+ 22.6
South Louisiana	2,503	2,456	— 1.9	978	1,062	+ 8.6	3,481	3,518	+ 1.1	84.8	90.4	+ 6.6
Michigan	350	340	— 2.9	3,184	3,135	— 1.5	3,534	3,475	— 1.7	13.9	13.6	— 2.2
Mississippi	205	218	+ 6.3	437	568	+30.0	642	786	+22.4	84.5	106.7	+ 26.3
Missouri				36	38	+ 5.6	36	38	+ 5.6	3.6	3.6	
Montana	31	26	—16.1	2,411	2,573	+ 6.7	2,442	2,599	+ 6.4	9.9	9.4	— 5.1
Nebraska				70	58	—17.1	70	58	—17.1	10.7	12.4	+ 15.9
New Mexico	2,822	3,005	+ 6.5	1,542	1,594	+ 3.4	4,364	4,599	+ 5.4	22.6	22.6	
New York				21,625	22,225	+ 2.8	21,625	22,225	+ 2.8	0.6	0.6	
Ohio	46	65	+41.3	23,029	22,907	— 0.5	23,075	22,972	— 0.5	0.3	0.4	+ 33.3
Oklahoma	1,337	1,512	+13.1	51,362	51,288	— 0.1	52,699	52,800	+ 0.2	7.3	7.1	— 2.7
Pennsylvania				83,230	82,998	— 0.3	83,230	82,998	— 0.3	0.4	0.4	
Tennessee				24	22	— 8.3	24	22	— 8.3	1.5	1.6	+ 6.7
*Texas	37,282	37,081	— 0.5	63,943	65,678	+ 2.7	101,225	102,759	+ 1.5	18.8	19.4	+ 3.2
District 1: South Central Texas	96	117	+21.9	3,225	3,132	— 2.9	3,321	3,249	— 2.2	5.7	5.8	+ 1.8
District 2: Refugio District	2,327	2,508	+ 7.8	761	775	+ 1.8	3,088	3,283	+ 6.3	40.6	41.1	+ 1.2
District 3: Upper Gulf Coast	5,071	4,982	— 1.8	3,100	3,250	+ 4.8	8,171	8,232	+ 0.7	52.2	51.3	— 1.7
District 4: Lower Gulf-Laredo District	3,432	3,560	+ 3.7	5,191	5,194	+ 0.1	8,623	8,754	+ 1.5	23.5	23.9	+ 1.7
District 5: East Central Texas	291	295	+ 1.4	1,383	1,398	+ 1.1	1,674	1,693	+ 1.1	21.3	49.9	+134.3
District 6: Northeast Texas	15,589	14,939	— 4.2	10,228	10,636	+ 4.0	25,817	25,575	— 0.9	15.6	16.2	+ 3.8
District 7-B: North Central Texas	582	651	+11.9	6,294	6,312	+ 0.3	6,876	6,963	+ 1.3	4.4	5.0	+ 13.6
District 7-C: West Texas	154	152	— 1.3	1,245	1,297	+ 4.2	1,399	1,449	+ 3.6	16.9	19.1	+ 13.0
District 8: West Texas	8,305	8,584	+ 3.4	8,127	8,761	+ 7.8	16,432	17,345	+ 5.6	26.9	28.8	+ 7.1
District 9: North Texas	1,398	1,250	—10.6	18,438	18,838	+ 2.2	19,836	20,088	+ 1.3	5.9	5.9	
District 10: Texas Panhandle	37	43	+16.2	5,951	6,085	+ 2.3	5,988	6,128	+ 2.3	13.7	13.2	— 3.7
West Virginia				17,268	17,211	— 0.3	17,268	17,211	— 0.3	0.4	0.4	
Wyoming	195	227	+16.4	3,788	3,818	+ 0.8	3,983	4,045	+ 1.6	21.6	25.0	+ 15.7
Total United States	**48,156**	**48,387**	**— 0.1**	**370,589**	**375,899**	**+ 1.4**	**419,045**	**424,286**	**+ 1.3**	**10.7**	**11.2**	**+ 4.7**

JOHN ZINK BURNERS



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UNITED STATES

Crude-Oil Pipe-Line Mileage by States[1]

STATE	CRUDE-OIL TRUNK LINES						CRUDE-OIL GATHERING LINES						TOTAL CRUDE-OIL PIPE LINES					
	1944	1943	1942	1941	1941[2]	1940	1944	1943	1942	1941	1941[2]	1940	1944	1943	1942	1941	1941[2]	1940
Arkansas	228	228	270	327	580	349	347	335	330	307	600	328	575	563	600	634	1,180	667
California					3,590						2,220						5,810	
Colorado	161	86	86	86	115	86	45	44	44		90		206	130	130	86	205	86
Illinois	4,467	4,455	4,459	4,385	4,280	4,070	2,048	2,035	1,892	1,737	1,850	1,051	6,515	6,490	6,351	6,122	6,130	5,121
Indiana	2,640	2,625	2,632	2,466	2,490	1,515	273	268	293	284	280	199	2,913	2,893	2,925	2,750	2,770	1,714
Iowa	103	103	103	103	95	96							103	103	103	103	95	96
Kansas	3,617	3,612	3,600	3,620	4,930	3,506	4,216	4,152	4,137	3,886	4,040	3,669	7,833	7,764	7,737	7,506	8,970	7,175
Kentucky	24	24	24	24	500	24	22	16			1,310	217	46	40	24	24	1,810	241
Louisiana	2,284	2,226	1,802	1,899	1,970	1,844	1,051	989	1,029	978	1,320	877	3,335	3,215	2,831	2,877	3,290	2,721
Maine	76	76	76	72									76	76	76	72		
Michigan	688	686	688	652	870	698	171	164	162	162	430	150	859	850	850	814	1,300	848
Mississippi	15						80	31	20	20	2	13	95	31	20	20	20	13
Missouri	4,761	4,746	4,756	4,728	4,610	4,463							4,761	4,746	4,756	4,728	4,610	4,463
Montana	166	76	53	53	140	26	252	241	246	215	350	144	412	317	299	268	490	170
Nebraska	385	385	386	386	380	386				16	10		385	385	386	402	390	386
New Hampshire	38	38	38	35									38	38	38	35		
New Jersey	141	269	269	175	110	176							141	269	269	175	110	176
New Mexico	344	344	342	544	450	560	1,011	988	938	731	900	675	1,355	1,332	1,280	1,275	1,350	1,235
New York	184	188	188	189	200	178	226	148	229	249	690	237	410	336	417	438	890	415
Ohio	2,937	2,937	2,945	2,804	2,630	3,084	3,338	3,374	3,395	4,940	4,940	4,590	6,275	6,311	6,340	6,297	7,570	7,674
Oklahoma	7,655	7,434	7,479	7,678	9,040	7,592	7,140	7,218	7,530	7,732	10,280	7,901	14,795	14,652	15,009	15,410	19,320	15,493
Pennsylvania	4,100	4,000	4,010	3,328	3,390	3,046	4,627	4,798	4,773	4,822	5,690	4,191	8,787	8,798	8,783	8,150	9,080	7,237
Texas	22,396	21,532	21,001	22,363	22,870	21,138	13,589	12,820	12,469	12,206	13,420	11,474	35,985	34,352	33,410	34,569	36,290	32,612
Utah	80	80	80	80	80	78							80	80	80	80	80	78
Vermont	59	59	59	59									59	59	59	59		
West Virginia	275	306	310	323	330	252	4,197	4,217	4,284	4,397	4,480	4,052	4,472	4,523	4,594	4,720	4,810	4,304
Wyoming	1,381	1,071	1,106	1,123	1,440	917	643	633	637	623	340	532	2,024	1,704	1,713	1,746	1,780	1,449
Total U. S.	59,259	57,586	56,762	57,502	65,180	54,084	43,276	42,471	42,318	41,858	53,170	40,300	102,535	100,057	99,080	99,360	118,350	94,384

[1] Reported by Interstate Commerce Commission, as of Dec. 31; does not include some purely intrastate and private pipe lines. First 1941 column is Bureau of Mines calculation of total pipe-line mileage, including private lines; this compilation indicates that ICC data covered, in 1941, approximately 85 percent of crude-oil trunk lines and 77 percent of gathering lines. [2] Bureau of Mines, as of May 1, 1941, latest complete census available. See footnote 1. **Authority:** API "Facts and Figures" which credits Interstate Commerce Commission and Bureau of Mines.

Pipe Line Construction

YEAR	MILES OF NEW PIPE LINE PLACED IN OPERATION[1]				MILES OF LINE BUILDING OR AUTHORIZED AT YEAR END[2]			
	Oil	Product	Gas	Total	Oil	Product	Gas	Total
1946	1610	1404	1271	4285	2099	2638	4771	9508
1945	1470	143	1598	3211	831	882	248	1961
1944	2219	518	2224	4961	112	....	286	398
1943	3795	3614	262	7671	848	....	1423	2371
1942	4200	2100	1250	7550	1147	428	140	1715
1941	2900	2700	1700	7300	322	....	446	768
1940	1615	575	810	3000	457	450	243	1150
1939	3155	840	305	4300	460	589	171	1220

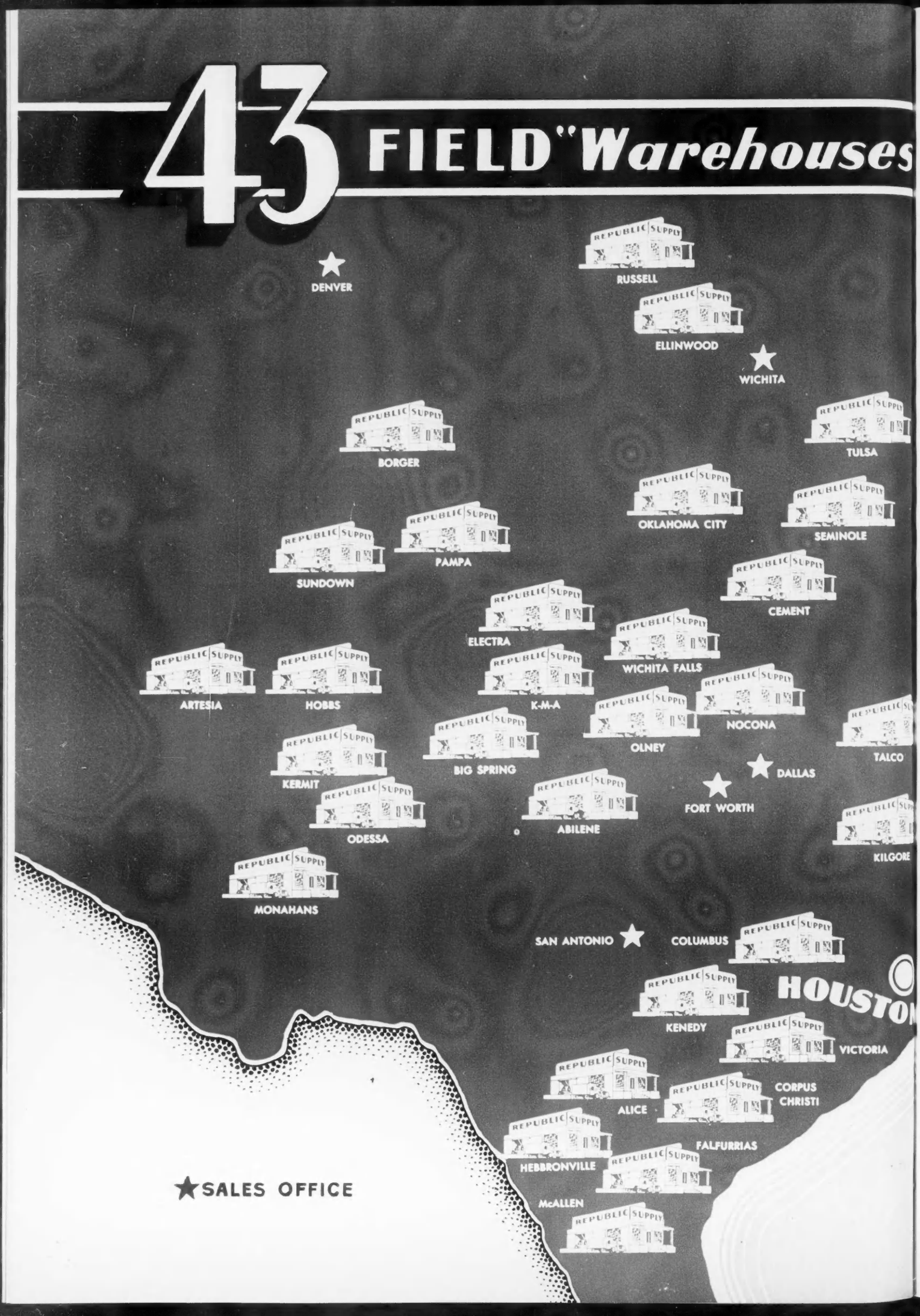
[1] These figures represent total length of new systems actually placed in operation during the year. [2] Mileage on all types of pipe line systems on which construction was still under way at end of year, plus mileage of new lines authorized. Natural gas lines include system authorized by Federal Power Commission, but not applications on which Federal Power Commission has not yet acted.

Crude Runs to Stills in Refineries and Percent of Refinery Capacity Used

Runs from Bureau of Mines, except November and December, 1946, from American Petroleum Institute; Capacities from American Petroleum Institute

(THOUSANDS OF BARRELS)

Refining District	CRUDE RUN IN DECEMBER							REFINING CAPACITY AND USE IN DECEMBER						CRUDE RUN DURING YEAR						
	Total Amount Run During Month				Daily Average Run During Month			Daily Capacity			Percent Capacity Used			Total Amount Run During Year				Daily Average Run During Year		
	Dec. 1941	Dec. 1945	Dec. 1946	% Diff. 1945-1946	Dec. 1941	Dec. 1945	Dec. 1946	Dec. 1941	Dec. 1945	Dec. 1946	Dec. 1941	Dec. 1945	Dec. 1946	1941	1945	1946	% Diff. 1945-1946	1941	1945	1946
East Coast	19,750	23,358	23,291	— 0.3	637	753	751	704	790	839	90.5	95.3	89.5	217,046	273,667	276,400	+ 1.0	595	750	757
Appalachian	4,575	4,769	5,007	+ 5.0	148	154	162	174	196	205	85.1	78.6	79.0	53,499	56,199	55,784	— 0.7	147	154	153
District No. 1	....	2,965	3,073	+ 3.6	....	96	99	....	146	143	....	65.8	69.2	....	35,745	35,093	— 1.8	....	98	96
District No. 2	....	1,804	1,934	+ 7.2	....	58	63	....	50	62	....	116.0	101.6	....	20,454	20,691	+ 1.2	....	56	57
Ill., Ind., Ky.	22,078	22,212	24,047	+ 8.3	712	716	776	776	857	870	91.8	83.5	89.2	251,257	275,853	280,175	+ 1.6	688	756	768
Okla., Kans., Mo.	10,711	11,598	11,886	+ 2.5	346	374	383	418	469	469	83.3	79.7	81.7	127,130	139,176	138,502	— 0.5	348	381	380
Texas Inland	5,761	6,034	6,763	+12.1	186	195	218	265	330	330	70.2	59.1	66.1	66,640	84,510	78,909	— 6.6	183	231	216
Texas Gulf Coast	33,919	35,416	36,349	+ 2.6	1,094	1,142	1,173	1,117	1,237	1,226	97.9	92.3	95.7	363,252	403,417	425,348	+ 5.4	995	1,105	1,165
Louisiana Gulf	4,925	9,163	10,693	+16.7	159	296	345	172	260	321	92.4	113.8	107.5	54,300	99,309	120,929	+21.8	149	272	331
Ark. and La. Inland	2,613	1,753	1,892	+ 7.9	84	57	61	97	126	126	86.6	45.2	48.4	29,365	27,937	21,907	—21.6	80	77	60
Rocky Mountains	2,848	3,679	4,285	+16.5	92	119	138	137	172	178	67.2	69.2	77.5	33,570	45,944	48,013	+ 4.5	92	126	132
District No. 3	....	358	352	— 1.7	....	12	11	....	13	13	....	92.3	84.6	....	4,459	4,020	— 9.8	....	12	11
District No. 4	....	3,321	3,933	+18.1	....	107	127	....	159	165	....	67.3	77.0	....	41,485	43,993	+ 6.0	....	114	121
California	17,805	23,797	24,889	+ 4.6	574	768	803	787	967	994	72.9	79.4	80.8	213,133	313,522	285,491	— 8.9	584	859	782
Total United States	124,985	141,779	149,102	+ 5.2	4,032	4,574	4,810	4,647	5,404	5,558	86.8	84.6	86.5	1,409,192	1,719,534	1,731,458	+ 0.7	3,861	4,711	4,744


43 FIELD "Warehouses
DENVER
RUSSELL
ELLINWOOD
WICHITA
TULSA
BORGER
OKLAHOMA CITY
SEMINOLE
PAMPA
SUNDOWN
CEMENT
ELECTRA
WICHITA FALLS
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DALLAS
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ODESSA
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★SALES OFFICE

UNITED STATES—Oil, Gas Reserves

U. S. Oil Reserves/Annual Production Ratio

YEAR	Barrels Proved Reserves at End of Year	Reserves Annual Production Ratio
1936	13,063,400,000	11.9:1
1937	15,507,268,000	12.1:1
1938	17,348,146,000	14.3:1
1939	18,483,012,000	14.6:1
1940	19,024,515,000	14.1:1
1941	19,589,296,000	14.0:1
1942	20,082,793,000	14.5:1
1943	20,064,152,000	13.3:1
1944	20,453,231,000	12.2:1
1945	20,826,813,000	12.2:1
1946	20,873,560,000	12.0:1

Proved Recoverable Reserves of Natural Gas Liquids of United States, December 31, 1946 (AGA Estimates)

(Thousands of Barrels)

	Non-Associated	Associated	Dissolved	Total
Arkansas	41,071	8,306	12,223	617,600
California	40,328	107,300	160,644	308,272
Colorado	775	410	1,192	2,377
Illinois			1,340[a]	1,340
Indiana			85[a]	85
Kansas	80,202	1,140	1,150	82,492
Kentucky	16,071[a]			16,071
Louisiana	330,466	75,019	13,911	419,396
Michigan			655[a]	655
Mississippi	17,212	34,095	192,594	243,901
Montana	8,534			8,534
New Mexico	27,697	30,950	14,962	73,609
Ohio	1,714[a]			1,714
Oklahoma	45,597	10,020	12,700	68,317
Pennsylvania	2,369[a]			2,369
Texas	1,292,177	296,072	397,357	1,985,606
West Virginia	19,285[a]			19,285
Wyoming	458	9,400	15,900	25,458
Miscellaneous[c]			6[b]	6
Total	1,923,896[b]	572,712[b]	824,419[b]	3,321,027

[a] Not allocable by types, but occurring principally in the column shown. [b] Approximate total; see footnote *. [c] Includes Alabama, Florida, New York and Utah.

NOTE—See table at right—Up to and including its figures on proved reserves of petroleum as of December 31, 1945, the committee combined under that heading the estimated proved reserves of cycle plant and lease condensate. As of December 31, 1945 the reserves so included totaled 884,967,000 barrels, leaving 19,941,846,000 barrels of crude oil only; and as of December 31, 1944 there were 668,701,000 barrels included. Beginning with this report the figures in this table are for crude oil only. If comparison is made between new oil reported in 1946 with new oil reported in earlier years, it should be remembered that the 1946 figures for new oil do not include new condensate which is estimated to be approximately 265,000,000 barrels.

Proved Oil Reserves of United States (API Estimate)

(Thousands of Barrels of 42 U. S. Gallons.)

STATES	Estimates Proved Reserves Crude Oil Plus Condensate (Dec. 31, 1945)	PROVED RESERVES OF CRUDE OIL—(Condensate not Included) Proved Reserves as of Dec. 31, 1945	Changes in Proved Reserves 1946 Extensions (New Oil) and Revisions	Proved Reserves in New Pools Discovered in 1946*	Production During 1946	Proved Reserves as of Dec. 31, 1946 (Columns 2+3+4 Less Column 5)
Alabama	785	785	109		382	512
Arkansas	303,674	287,623	4,172	1,764	26,501	267,058
California	3,409,948	3,318,006	276,787	13,876	315,178	3,293,491
Colorado	259,830	259,830	51,265	800	12,025	299,870
Illinois	349,620	349,620	72,452	4,606	75,414	351,264
Indiana	41,243	41,243	7,878	1,633	6,684	44,070
Kansas	541,846	541,846	87,319	12,629	96,478	545,316
Kentucky	56,721	56,721	13,066	88	10,687	59,188
Louisiana	1,689,781	1,558,891	207,018	25,857	139,969	1,651,797
Michigan	64,186	64,186	21,576	415	17,000	69,177
Mississippi	267,160	257,363	34,939	1,790	23,871	270,221
Montana	108,474	108,474	2,576	2,000	8,804	104,246
Nebraska	500	500	665		290	875
New Mexico	512,373	512,373	65,000	2,871	36,791	543,453
New York	81,189	81,189			4,900	76,289
Ohio	29,681	29,681	3,047		3,508	29,220
Oklahoma	889,839	888,839	98,423	47,731	136,807	898,186
Pennsylvania	110,601	110,601			13,100	97,501
Texas	11,470,294	10,835,257	1,441,158	126,594	756,649	11,646,360
West Virginia	38,630	38,630			2,975	35,655
Wyoming	600,131	599,881	25,919	1,780	38,222	589,358
Miscellaneous†	307	307	259		113	453
Total U.S.	20,826,813	19,941,846	2,413,628	244,434	1,726,348	20,873,560

* Only a limited area is assigned to each new discovery even though the committee may believe that eventually a much larger area will produce. † Includes Florida, Missouri, Tennessee, Utah and Virginia.

API Oil Reserves Estimates of United States, 1937-1946

(Thousands of Barrels of 42 U. S. Gallons.)

YEAR	NEW OIL BLOCKED OUT DURING YEAR: Through Revisions to Previous Estimates and Extensions to Known Fields	Through New Pools Discovered During Year	Total Through New Discoveries, Extensions and Revisions	Production During Year	Estimated Proved Reserves as of End of Year	Increase Over Previous Year
1936					13,063,400	
1937	2,792,790	928,742	3,721,532	1,277,664	15,507,268	2,443,868
1938	2,243,571	810,493	3,054,064	1,213,186	17,348,146	1,840,878
1939	2,058,455	340,667	2,399,122	1,264,256	18,483,012	1,134,866
1940	1,607,012	286,338	1,893,350	1,351,847	19,024,515	541,503
1941	1,538,989	429,974	1,968,963	1,404,182	19,589,296	564,781
1942	1,618,925	260,051	1,878,976	1,385,479	20,082,793	493,497
1943	1,202,368	282,418	1,484,786	1,503,427	20,064,152	(—)18,641
1944	1,556,192	511,308	2,067,500	1,678,421	20,453,231	389,079
1945	1,690,315	419,984	2,110,299	1,736,717	20,826,813	373,582
1946	2,413,628	244,434	2,658,062	1,726,348	20,873,560	931,714

See note at left.

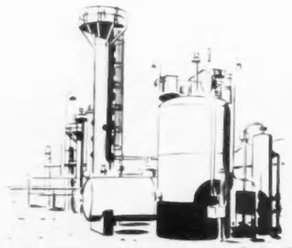
Proved Recoverable Reserve of Natural Gas of United States (AGA Estimate)

(Millions of Cubic Feet)

	CHANGES IN RESERVES DURING 1946: Reserves as of Dec. 31, 1945	Discoveries, Extensions and Revisions	Net Production	Net Increase	RESERVES AS OF DECEMBER 31, 1946: Total	Non-Associated	Associated	Dissolved
Alabama	23	75	1	74	97			97
Arkansas	869,686	54,171	52,195	1,976	871,662	447,651	162,276	261,735
California	10,855,707	803,056	532,462	270,594	11,126,301	3,687,430	3,198,714	4,240,157
Colorado	396,282	(—) 70,905	9,614	(—) 80,519	315,763	155,440	41,075	119,248
Illinois	268,000	33,500	33,500		268,000	3,000	55,000	210,000
Indiana	17,000	3,200	3,200		17,000	4,000	8,000	5,000
Kansas	13,250,605	636,771	206,532	430,239	13,680,844	13,257,617	212,310	210,917
Kentucky	1,436,800	44,200	95,000	(—) 50,800	1,386,000	1,299,000		87,000
Louisiana	19,849,393	3,170,050	607,932	2,562,118	22,411,511	18,323,314	2,697,126	1,391,071
Michigan	8,931	148,069	26,000	122,069	131,000	76,200		54,800
Mississippi	2,007,859	383,842	21,188	362,654	2,370,513	1,731,821	446,098	192,594
Montana	1,202,521	(—)319,521	29,599	(—)349,120	853,401	853,401		
Nebraska	375	(—) 374		(—)374	1			1
New Mexico	5,190,309	899,737	185,260	714,477	5,904,786	3,079,900	2,132,911	691,975
New York	76,000	900	7,000	(—) 6,100	69,900	69,000		900
Ohio	626,800	46,200	59,000	(—) 12,800	614,000	573,000		41,000
Oklahoma	10,079,938	1,311,816	655,908	655,908	10,735,845	7,572,279	1,589,538	1,574,028
Pennsylvania	520,000	61,000	78,000	(—) 17,000	503,000	453,000		50,000
Texas	78,306,676	10,154,021	2,097,238	8,056,783	86,363,459	62,345,192	15,282,025	8,736,242
West Virginia	1,928,300	116,700	205,000	(—) 88,300	1,840,000	1,739,000		101,000
Wyoming	816,763	252,379	33,545	218,834	1,035,597	693,191	235,176	107,230
Miscellaneous*	81,399	265	4,443	(—) 4,178	77,221	76,900		321
Total	147,789,367	17,729,152	4,942,617	12,786,535	160,575,901	116,440,336	26,060,249	18,075,316

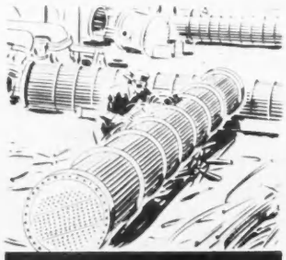
* Includes Florida, Missouri and Utah. **Notes:** Volumes are reported at a pressure base of 14.65 pounds per square inch absolute, and at a standard temperature of 60° F. Net production equals estimated gross withdrawals, less gas reinjected into underground reservoirs. Reserves of **dissolved** gas were estimated jointly with the API Committee on Petroleum Reserves.

THESE 8 ADVANTAGES OF PETRECO DESALTING ARE REFINERY MONEY SAVERS



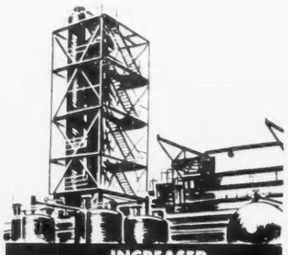
1 HIGH PERCENTAGE SALT REMOVAL

Petreco Desalting usually insures a salt removal of 90% or better, with 98% not uncommon.



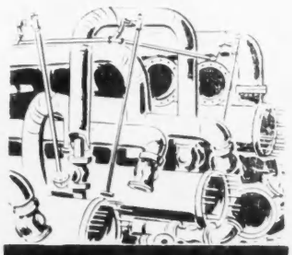
2 CORROSION PREVENTION

Petreco Desalting reduces corrosion by curtailing the evolution of HCl.



3 INCREASED CRACKING EFFICIENCY

A refinery comparison of two cracking stills shows a 1¢ cent per barrel gain for the still handling desalted crude—after desalting costs were met.



4 LESS "DOWN TIME"

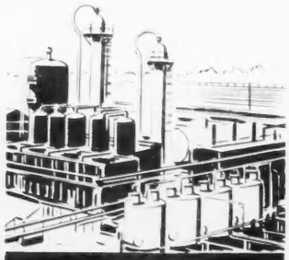
"Down time" is frequently reduced as much as 50 to 90% wherever Petreco Desalters are installed.

5 ELIMINATION OF PLUGGING

A Petreco Desalter virtually always eliminates salt plugging.

6 TANK BOTTOMS DISPOSAL

Many refiners materially increase tank storage space by adding tank bottoms to the crude being desalted.



7 INCREASED REFINING CAPACITY

Increases in refining capacity varying from ten to several hundred per cent are frequently credited to Petreco Desalters.

8 PETRECO SERVICE

Petreco engineers supervise every desalter installation, and inspect equipment periodically—they are constantly "on call."

In many cases, the savings accruing from one or two of these advantages are more than enough to defray the nominal cost of Petreco Desalting.

For complete information, and a tentative plan for Petreco economies in your operations, have a Petreco engineer call on you. Economical process improvements have frequently started with a Petreco conference. There is no charge for this service.

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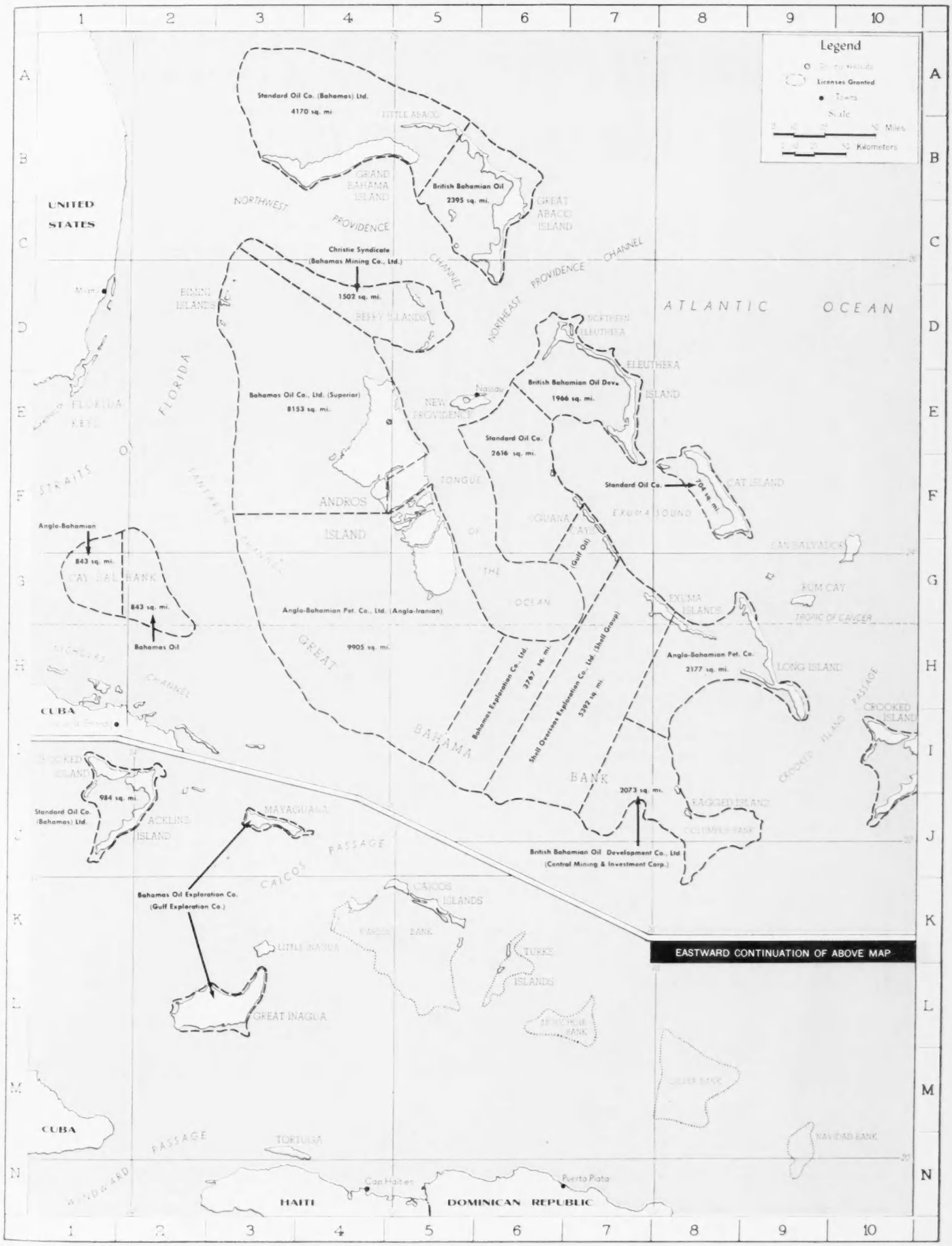
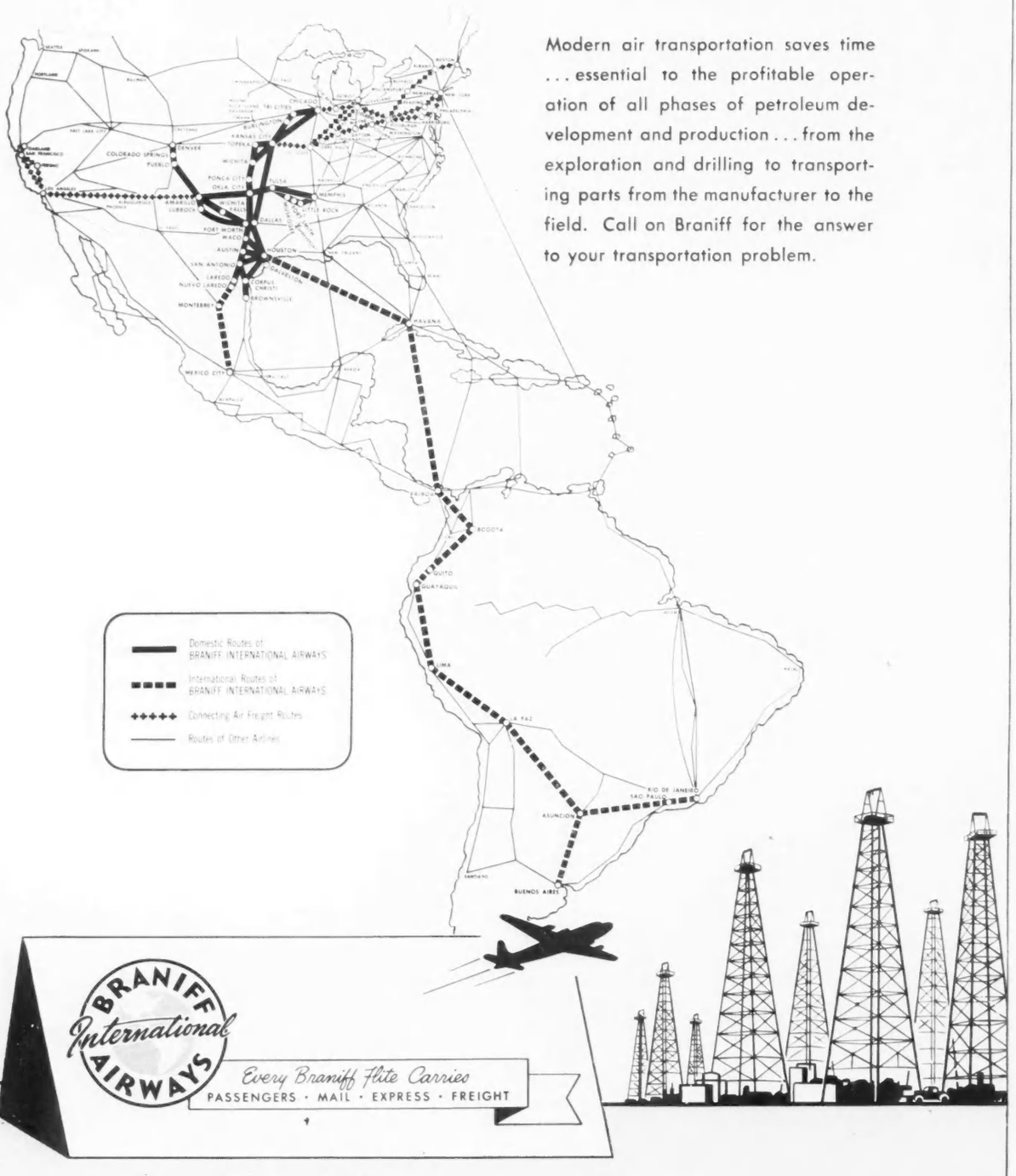
DESALTING ★ *ELECTRICAL PROCESS* ★ DEHYDRATING

WEST INDIES—Bahama Islands Concessions



BRANIFF FLITES *Speed-Link* THE OIL INDUSTRIES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WEST INDIES—Bahama Islands

WITH one wildcat test actually drilling, future development of the oil possibilities of the Bahama Islands will depend upon the outcome of extensive geological and geophysical work now being conducted on the islands and in the waters surrounding the islands.

The active wildcat test is being drilled by Bahamas Oil Company, Ltd., (Superior Oil Company of California) in the approximate center of the north end of Andros Island. The test was spudded about a year ago and is drilling below 13,000 feet.

Anglo-Bahamian Petroleum Company, Ltd., (Anglo-Iranian Oil Company) holds the concession on the southern end of Andros Island and is expected to stake location for a wildcat test following completion of its geological and geophysical work. The company presently is engaged in a gravity survey over southern Andros Island, a magnetometer survey of the same area, and a gravity survey of the marine areas adjacent to the southern end of the island. The company also is starting a seismic survey of the area and is participating in an aerial magnetic survey.

Equipped with a diving chamber and using radar to plot positions, Standard Oil Company (Bahamas), a subsidiary of Standard Oil Company (New Jersey) is mapping formations far below the ocean bed in the waters adjacent to the Bahama Islands. An operator uses a gravity meter inside the diving chamber.

Exploration Licenses

Seven companies have acquired oil exploration licenses on the Bahama Islands and adjacent waters totaling 47,399 square miles (30,335,360 acres).

Companies holding licenses include Anglo-Bahamian Petroleum Company, Ltd., (Anglo-Iranian), 12,925 square miles; Bahamas Oil Company, Ltd., (Superior), 8996 square miles; Standard Oil Company (Bahamas), (Standard of New Jersey), 8474 square miles; British Bahamian Oil Development Company, Ltd., (Central Mining & Investment Corporation, a British company), 6434 square miles; Shell Overseas Exploration Company, Ltd., (Anglo-Saxon Petroleum Company), 5392 square miles; Bahamas Oil Exploration Company, Ltd., (Gulf Exploration Company), 3676 square miles; and The Christie Syndicate, (a local company), 1502 square miles.

Much of the area on which petroleum licenses have been acquired are in the relatively shallow waters surrounding the numerous islands and banks that are found in the Bahama region.

WEST INDIES—Cuba

ESTIMATED crude oil production in Cuba during 1946 was boosted considerably and totaled about 268,000 barrels as compared with 171,900 barrels in 1945.

Along with the increased output American operating companies are continuing important geological and geophysical studies in various parts of the island. Standard Oil Company of Cuba (Standard of New Jersey) is continuing its wildcat drilling program in Pinar del Rio Province. During 1945 this company drilled three dry holes in the province near Paso Real and is currently drilling a fourth test.

Cia. Petrolera La Estrella de Cuba (Shell group) is currently engaged in drilling a deep wildcat test on Cayo Coco, an off-shore island immediately north of the town of Moron in the northwest part of Camaguey Province. After a core test was drilled to 2834 feet, the company moved in a heavy rig and started its deep test. At last report, the wildcat was drilling below 6000 feet.

The largest producing area in Cuba is the Jarahueca field in Santa Clara Province. This field, discovered in 1943, produced approximately 200,000 barrels of oil during 1946 as against 105,700 barrels in 1945. The increased production was obtained through an aggressive drilling program conducted during the past two years. The producing formation at Jarahueca is "serpentine," an igneous rock, which is not a source bed, and for this reason the operators in the field have considered the production as "seepage production." This field has about 50 producers with the oil being 37.6-gravity. The depth of production in the field ranges from 750 feet to about 1500 feet.

The Motembo field, Santa Clara Province, is the oldest producing area in Cuba, having been opened in 1880. This field produces natural gasoline from the Serpentine formation in the Upper Eocene with the gravity being between 58 and 61 degrees API. The structure is a Monocline igneous barrier accumulation with pay depths ranging from 600 to 1800 feet. During 1946 the total output is estimated at 68,000 barrels, about the same amount as was produced in 1945. In spite of an active drilling campaign, the production of the field has not been materially increased during the past two or three years.

The Bacuranao field in Habana Province produced less than a 1000 barrels during 1946 and activity is practically dormant. During 1945 only five shallow wells were drilled, all dry holes.

Cuban independent operators are conducting the development work in the proven fields. Future Cuban oil developments probably will depend upon the establishment of deep production as the shallow beds have been tested thoroughly.

Amendments to Minerals Law

During the later part of 1946 a Cuban senate committee conducted hearings on a bill to amend the country's combustible minerals law and no further action has been reported. The bill was reported to include provisions for the establishment of a national geological commission; employment of foreign personnel to perform geological and geophysical studies; purchase of deep well drilling equipment; exemption of concessionaires in Motembo from the payment of royalties for a period of 10 years and a reduction of the royalty to five percent after that period; reduction of the royalty on Jarahueca oil to five percent; establishment of subsidies for drilling operations, and authorization for the government to exploit petroleum reserves before 1948.

Refineries of Cuba

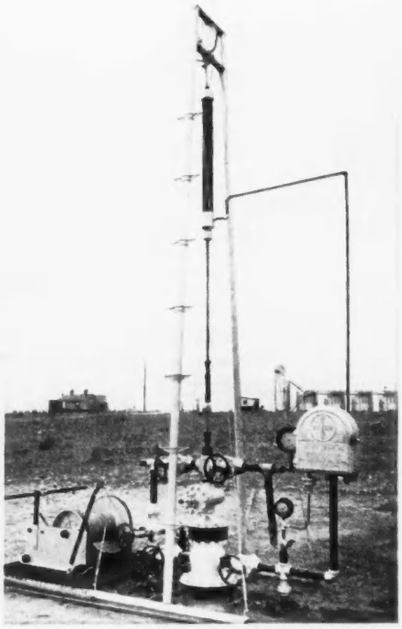
COMPANY	Location of Plant	Crude Charging Capacity (Barrels Daily)	Cracking Capacity (Barrels Daily)	Type of Refinery	Operating Status
Standard Oil Company of Cuba	Belot	4200	2100	S-C-L-A-	Operating
Cia. Cubana de Petroleo, S.A.	Havana	500	None	Skimming	Operating
Petrolera Jarahueca	Jarahueca Field	200	None	Skimming	Operating
Total	3 Plants	4900	2100		

IF IT'S A NIXON PRODUCT IT'S NEEDED

Several thousand Nixon Gas Lifts are now in successful operation—lifting fluid economically and dependably.

Operating fundamentally as a gas displacement pump, the Nixon Gas Lift is applicable to all wells—regardless of depth or volume of fluid to be lifted.

Being a closed system, the Nixon Gas Lift can economically produce several average wells on a lease by the use of a small compressor unit. The Nixon way is the modern way of lifting fluid.



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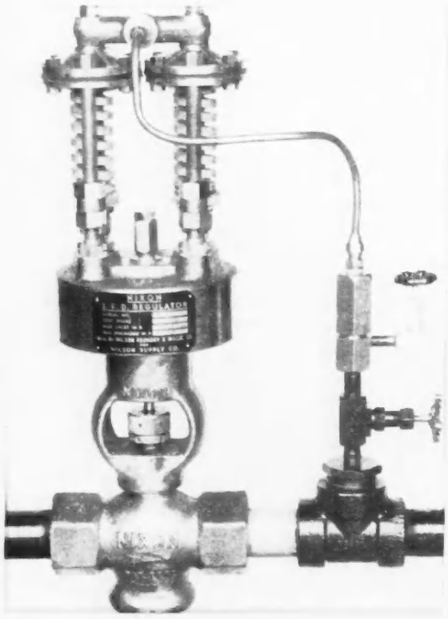
Selective Flow Differential

REGULATORS



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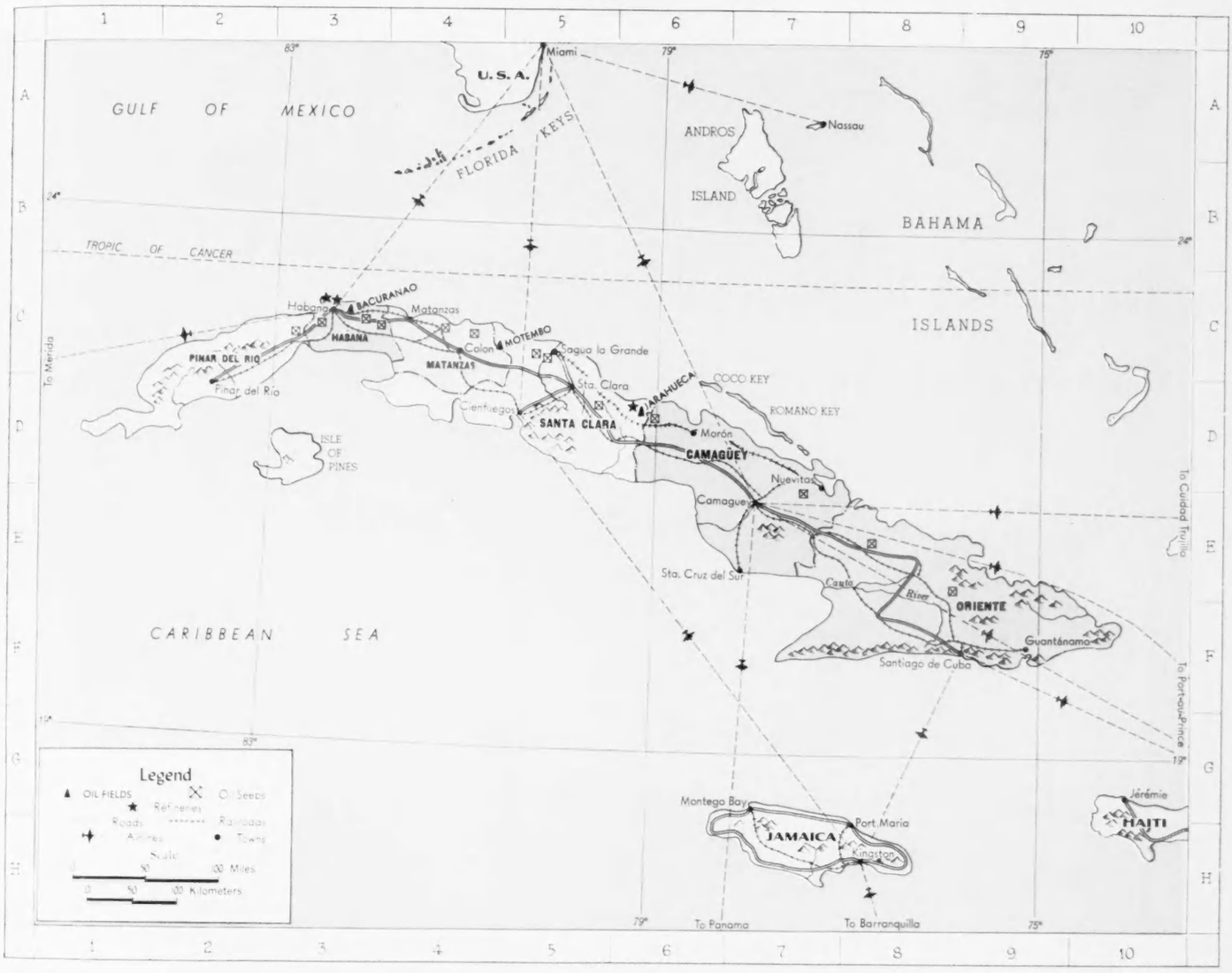
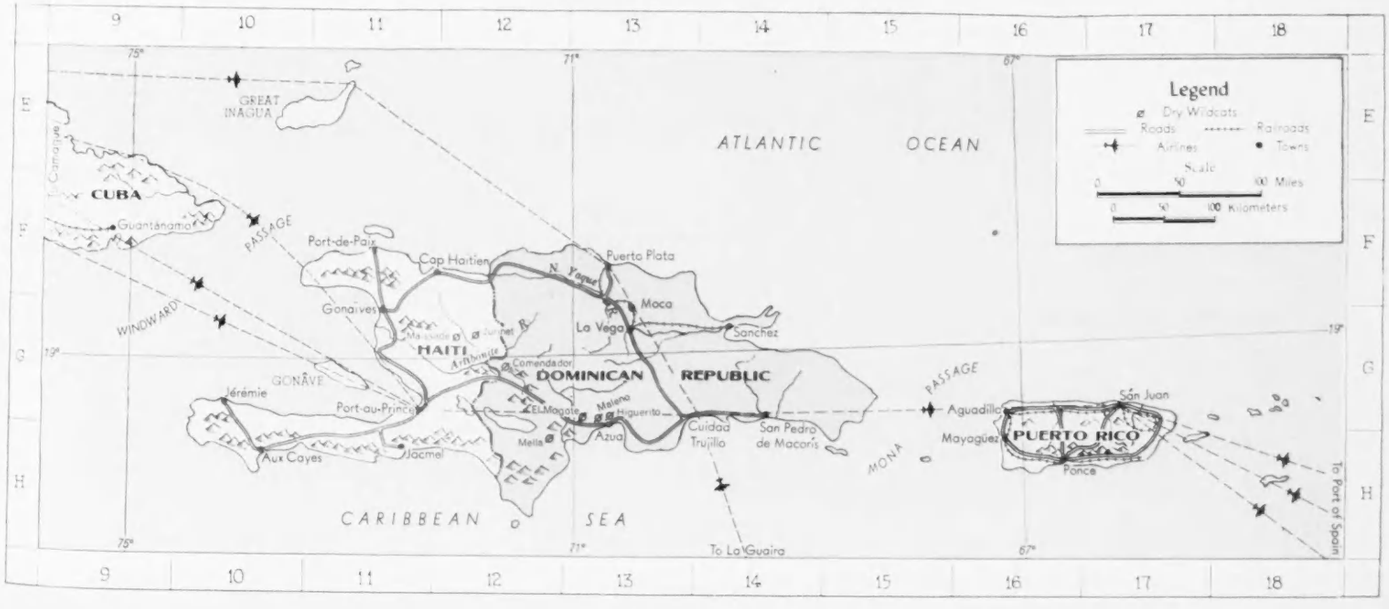
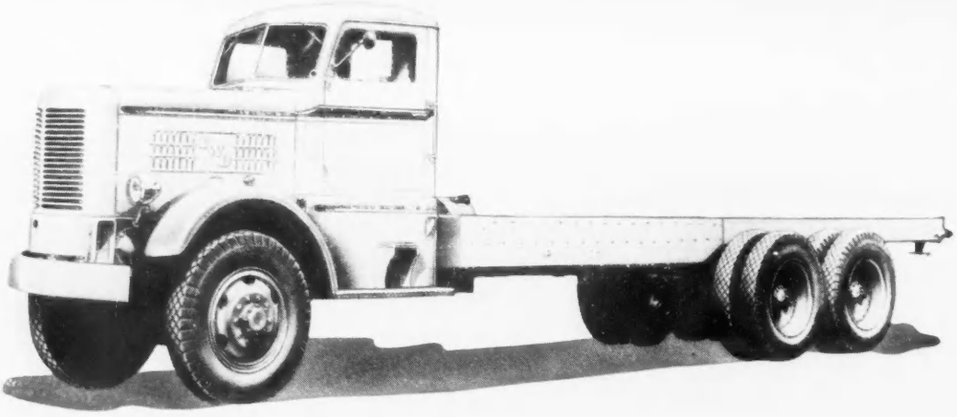


Dominican Republic and Haiti



FWD TRUCKS



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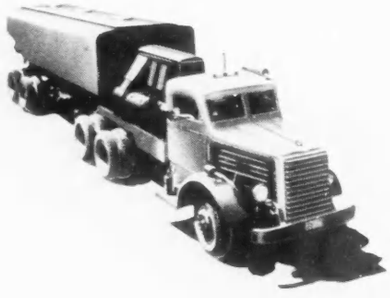

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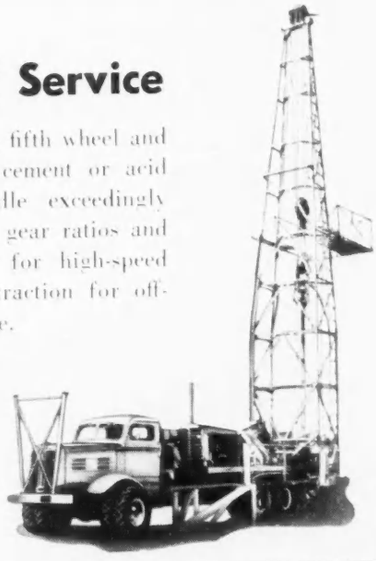

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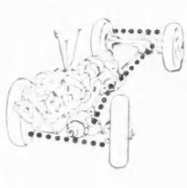

have ability to carry or tow heavy loads through mud, sand and over mountainous country often impassable to ordinary trucks. On highways they can be operated at higher speed and with greater safety because driving power on all wheels gives the operator better control of truck and load.

WEST INDIES—Dominican Republic and Haiti

DOMINICAN Republic and Haiti, the two countries on the island of Hispaniola, again were the scene of wildcat drilling during 1946. However, as yet oil in commercial quantities has not been found.

The only operator presently active in Dominican Republic is Dominican Seaboard Oil Company. During 1946, the company abandoned its Mella 1 in the southwestern part of the Republic, northwest of the town of Barahona, at 8768 feet.

This was the fourteenth wildcat test drilled in Dominian Republic by Dominican Seaboard since 1939. The company's first two tests, drilling in 1939 on the Maleno structure, produced some low-gravity oil before being abandoned. In 1943, the company drilled five dry holes in the vicinity of the first two tests.

Dominican Seaboard's Mella 1 is the deepest test yet drilled in the Republic. In 1945, the company's Comendador 1 reached 5896 feet before being abandoned.

The Atlantic Refining Company is the only active operator at Haiti. In 1944, the company completed its Maissade 1, located 47 miles north-northeast of Port-Au-Prince, at 9010 feet in the Oligocene formation.

Earlier in 1944, the company drilled its Jurinet 1, located in the same general area as the Maissade 1, to 7005 feet where it was abandoned and the rig moved to the Maissade 1. After the second test was abandoned, the rig was moved back to the Jurinet 1 and this test was carried to 8000 feet where drilling was halted.

Reports now say that Atlantic Refining Company is drilling at about 7000 feet in a third test at Haiti.

Wildcat Tests Drilled in Dominican Republic

COMPANY AND WELL	Year Completed	Total Depth	REMARKS
Maleno Structure			
Interocean's Well No. 3	1933	2826	Abandoned
Dominican Seaboard's Maleno 1	1939	1197	Produced 12,966 barrels of 19.9 gravity oil before being abandoned
Dominican Seaboard's Maleno 1-A	1939	3033	Produced 4553 barrels of 19.9 gravity oil before being abandoned
Dominican Seaboard's Maleno 2.	1943	808	Abandoned
Dominican Seaboard's Maleno 3.	1943	1570	Abandoned
Dominican Seaboard's Maleno 4.	1943	846	Abandoned
Dominican Seaboard's Maleno 5.	1943	664	Abandoned
Dominican Seaboard's Maleno 6.	1943	705	Abandoned
Higuerito Structure			
Lancaster & Krieder's Well No. 1	1904	935	Gas blow-out at 1935 feet; produced some oil before being abandoned
Lancaster & Krieder's Well No. 2.	1905	400	Abandoned
Lancaster & Krieder's Well No. 3.	1905		Abandoned
Lancaster & Krieder's Well No. 4.	1906	120	Abandoned
Lancaster & Krieder's Well No. 5.	1907		Abandoned
Interocean's Well No. 1	1919	2166	Abandoned
Interocean's Well No. 2	1922	2677	Abandoned
The Texas Company's Well No. 1	1928	2893	Abandoned
Dominican Seaboard's Higuerito 1	1943	3459	Abandoned
Dominican Seaboard's Higuerito 2	1944	3137	Abandoned
Quita Coraza Structure			
Dominican Seaboard's Quita Coraza 1	1940	4300	Abandoned
El Mogote Structure			
Dominican Seaboard's El Mogote 1	1940	4300	Abandoned
Las Hormigas Structure			
Dominican Seaboard's La Hormigas 1	1940	5070	Abandoned
Comendador Structure			
Dominican Seaboard's Comendador 1	1945	5896	Abandoned
Barahona Structure			
Dominican Seaboard's Mella 1	1946	8769	Abandoned

CENTRAL AMERICA

THE only oil activity in Central America is being conducted in Nicaragua and Panama.

Gulf Oil Corporation and The Atlantic Refining Company are preparing to drill a second wildcat test in Nicaragua near the Caribbean Sea in an eight-foot lagoon. Location for this test was made following further geophysical work and interpretation of data from the same operators' Punta Gordo 1, abandoned February, 1945, at 6735 feet. The Punta Gordo 1, a slim-hole stratigraphic test, was the deepest test ever drilled in Central America. A diesel-powered rig has been moved in from the Punta Gordo and the drilling equipment is capable of drilling to depths around 10,000 feet.

Geological work is being conducted by Sinclair Panama Oil Corporation in Panama on its recently obtained concession of approximately 18,125,000 acres. The company, owned by Venezuelan Petroleum Company and Cities Service Company, obtained the concession for 20 years with an option to extend for a like period. The company is to make a selection of acreage following three years of exploration if it so desires, turning back the acreage not retained into the government reserve. Actual drilling operations are not required until after the initial three-year period and then must start within six months thereafter. A lump rental sum of $25,000 annually is stipulated for each of the three exploratory years, and thereafter rentals will be fixed on an acreage basis. Several wildcat ventures were drilled in Panama in the 1920's by Sinclair Panama, Panama Gulf Oil Corporation and The Texas Company but all were abandoned. Two of the tests reported slight shows of oil and gas.

First oil drilling in Central America was in Costa Rica. This was by Costa Rica Oil Corporation (Sinclair) but very few shows were found. One test, drilled in 1922, had gas shows at 822 feet. There is no activity in Costa Rica now.

Guatemala has been the scene of some geological study but presently no one holds a petroleum concession in the country. Proposals have been made to change the petroleum law in Guatemala to make development of the country's oil possibilities more attractive to outside capital. Concessions in the country have been held by the Shell group and Gulf interests but no tests have been drilled.

Some geological work has been conducted in other countries of Central America but no recent activity has been reported.

Oil Tests Drilled in Central America

Country, Company and Well	Date Completed	Total Depth (Feet)	RESULTS
Costa Rica			
Costa Rica Oil Corporation's (Sinclair) Cahuita 1	1922	3862	Abandoned. Gas shows at 822 feet
Costa Rica Oil Corporation's (Sinclair) four shallow tests	1923	1400	All abandoned
Costa Rica Oil Corporation's (Sinclair) Puerto Viejo	1923	2410	Abandoned
Nicaragua			
Gulf and Atlantic's Punta Gorda 1	1945	6735	Abandoned
Miquel d'Escato's Cayetano 1.		500	Abandoned
Davis & Company's San Rafael 1	1935	3940	Abandoned
Panama			
Sinclair Panama Oil Corporation's Boeas del Toro 1	1922	1625	Abandoned, casing collapsed
Sinclair Panama Oil Corporation's Boeas del Toro 2	1922	3250	Abandoned
The Texas Company's David 1.	1925	3862	Abandoned
Panama Gulf Oil Corporation's Garchine 1	1924	3250	Abandoned
Panama Gulf Oil Corporation's Garachine 2	1924	3069	Abandoned. Had slight oil shows
Panama Gulf Oil Corporation's Garachine 3	1928	4986	Abandoned. Had some gas shows
Sinclair Panama Oil Corporation's Yape 1	1927	3508	Abandoned
Sinclair Panama Oil Corporation's Capeti 1	1927	995	Abandoned
Sinclair Panama Oil Corporation's Capeti 2	1927	3000	Abandoned

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Belize
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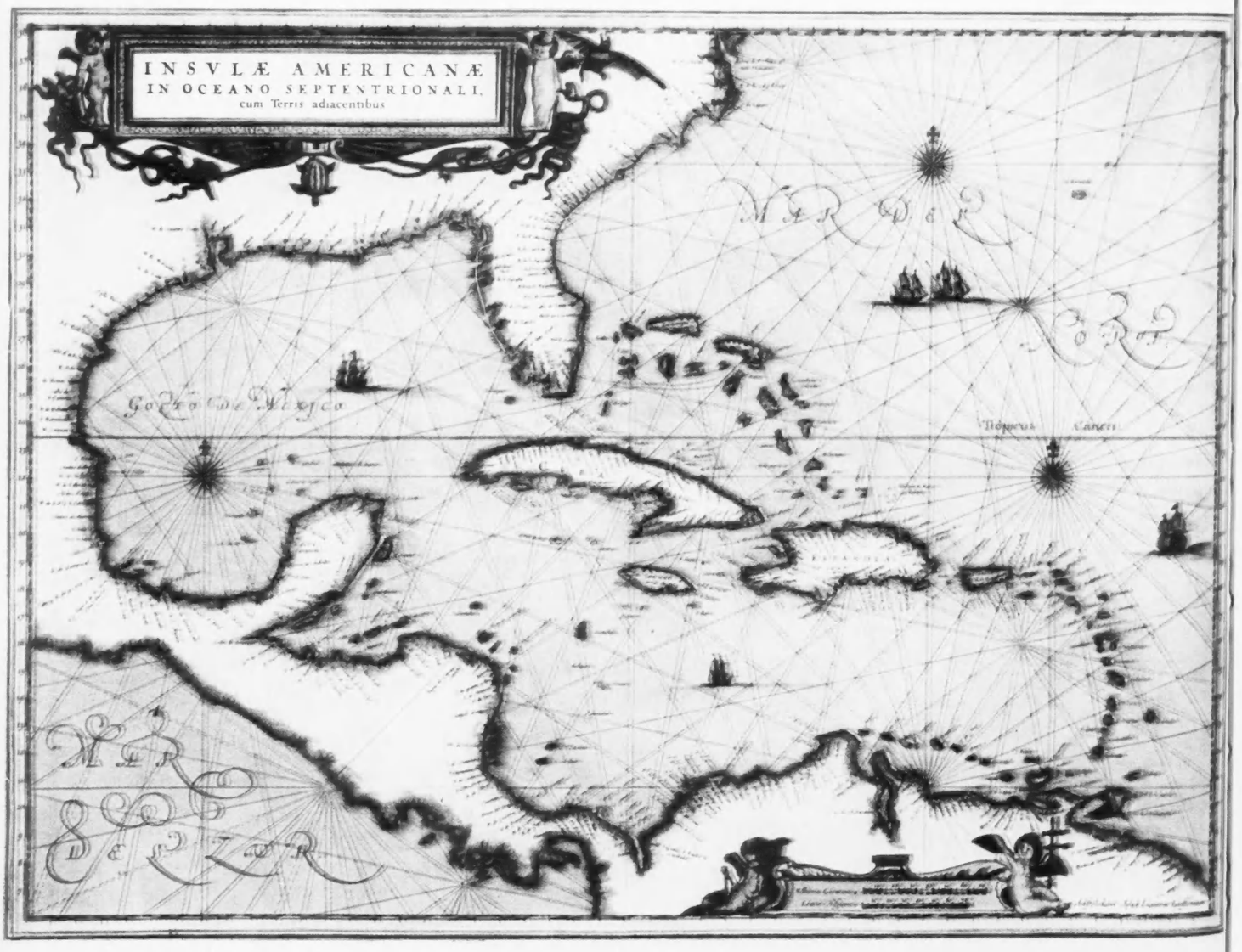

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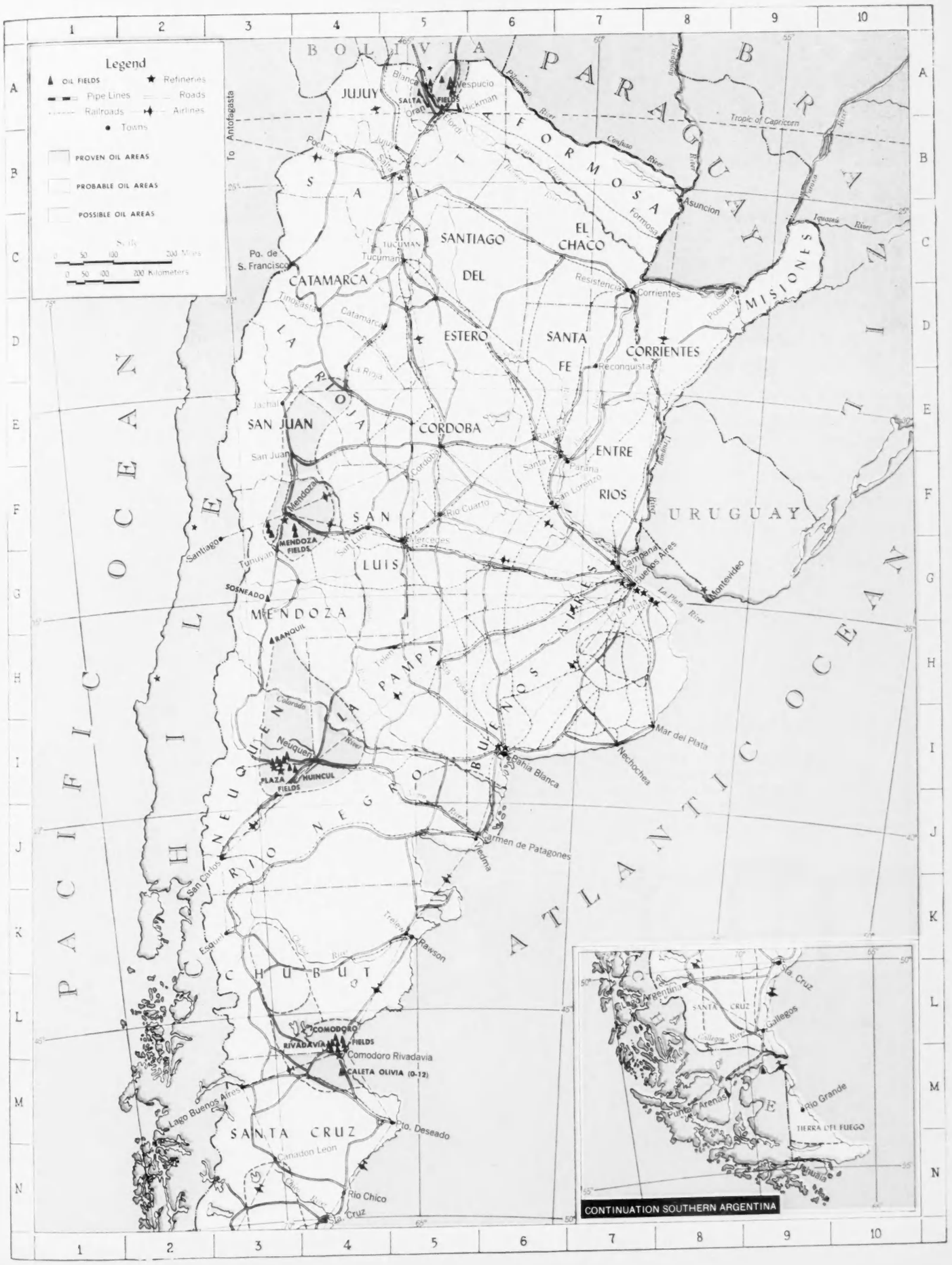
ARGENTINA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PACIFIC OCEAN
ATLANTIC OCEAN
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SALTA
ORAN FIELDS
Vespucio
Hickman
To Antofagasta
Pocitas
Jujuy
Salta
Pilcomayo River
Bermejo River
Tropic of Capricorn
Confuso River
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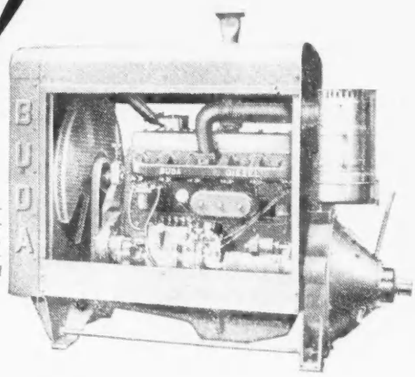
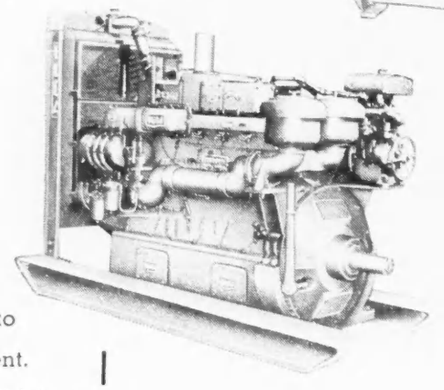


• *Right: BUDA 6-cylinder Model 6-DC-844 Diesel engine. One of Buda's modern series of oil field engines.*



• *Left: BUDA 6-cylinder Supercharged Diesel Drilling Engine Model 6-DCS-1879*

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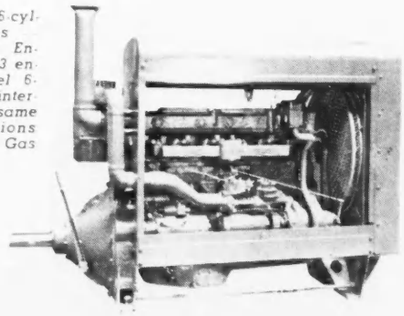

• *Right: BUDA 6-cylinder Natural Gas Gasoline Butane Engine Model MO-893 engine. Diesel Model 6-DC-844. Engine is interchangeable with same mounting dimensions as the 6-MO-893 Gas Engine.*

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ARGENTINA

HANDICAPPED by lack of drilling equipment and tubular goods, oil activities in Argentina slumped considerably during 1946. Crude oil production for the year is estimated at 20,603,729 barrels, the lowest since 1940, and slightly more than 10 percent under the output in 1945.

No new oil discoveries were reported during the year and the number of new wells drilled in productive areas was less than the number of producing wells abandoned during the year. This was especially true in the operations of Yacimientos Petroliferos Fiscales (Government Oil Fields), the largest operator in Argentina.

However, plans are being worked out to expand oil operations in Argentina. The country's proposed Five-Year Plan for economic and social development is reported to include an expenditure of 620 million pesos ($155 million) for petroleum exploration, exploitation and industrialization. An additional 270 million pesos ($67 million) is proposed for natural gas development projects.

Plans are being studied for construction of a 1100-mile, 10¾-inch gas pipe line from the Comodoro Rivadavia fields to Buenos Aires. Capacity would be 21 million cubic feet daily. Gas reserves at Comodoro Rivadavia are estimated from 490 to 875 billion cubic feet.

Under the proposed Five-Year Plan, production would be increased 50 percent, refineries modernized and new plants erected, and additions made to the tanker fleet.

Drilling machinery ordered and purchased in the United States began to reach Argentina at the end of 1946 in small amounts for some private oil companies. Unless the YPF receives the required equipment Argentina's activities during 1947 may continue to decline.

Production and Drilling

There are four principal oil producing regions in Argentina—Comodoro Rivadavia, in Chubut Province; Mendoza, in

Producing Wells and Drilling Activity in Argentina by YPF and Private Companies

YEAR	PRIVATE COMPANIES: Wells Completed in Year	PRIVATE COMPANIES: Feet Drilled During Year	PRIVATE COMPANIES: Wells Producing End of Year	GOVERNMENT (YPF): Wells Completed in Year	GOVERNMENT (YPF): Feet Drilled During Year	GOVERNMENT (YPF): Wells Producing During Year	TOTAL Private and Government: Wells Completed in Year	TOTAL Private and Government: Feet Drilled During Year	TOTAL Private and Government: Wells Producing End of Year
1939	153	414,625	1278	164	652,533	1854	317	1,067,158	3132
1940	120	347,680	1274	187	721,226	1950	307	1,068,906	3224
1941	149	406,858	1356	226	878,568	2150	375	1,285,426	3506
1942	162	460,568	1448	203	885,528	2355	365	1,346,096	3803
1943	119	436,850	1426	144	656,528	2465	263	1,093,378	3891
1944	122	363,109	1463	103	483,206	2490	225	846,315	3953
1945	98	305,472	1365	126	403,501	2557	224	708,973	3922
1946	115	296,050	1384	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.

n.a. indicates data not available.

Argentina Crude Oil Production by Regions, YPF and Private Companies for Recent Years

YEAR	CHUBUT: YPF	CHUBUT: Private[2]	NEUQUEN: YPF	NEUQUEN: Private[3]	SALTA: YPF	SALTA: Private[3]	MENDOZA: YPF	MENDOZA: Private[4]	TOTAL: YPF	TOTAL: Private	GRAND TOTAL
Prior to 1944	137,506,552	100,295,396	10,394,011	10,975,559	6,514,912	16,636,947	13,218,743	319,236	167,634,218	128,227,138	295,861,356
1944	10,226,615	6,875,895	1,923,249	445,005	961,665	682,081	3,094,396	21,292	16,205,925	8,024,273	24,230,198
1945	9,722,422	6,411,096	1,964,141	382,061	605,281	618,949	3,102,020	14,999	15,453,864	7,427,105	22,880,969
1946	8,648,750[1]	5,680,585	1,918,450[1]	343,960	459,170[1]	556,063	2,987,750[1]	9,001	14,014,120[1]	6,589,609	20,603,729[1]
Cumulative to 12-31-46	166,104,339	119,262,972	16,199,851	12,146,585	8,601,028	18,494,040	22,402,909	364,528	213,308,127	159,268,125	363,576,252
Daily Average Production, 1946	23,695[1]	15,563	5,256[1]	942	1,258[1]	1,524	8,185[1]	27	38,394[1]	18,054	56,448[1]

[1] YPF 1946 production estimated. [2] Includes Diadema, Ferrocarrilera, and Astra. [3] Standard Oil. [4] El Sosneado.

Oil Wells and Crude Oil Production of Argentina

PROVINCE AND FIELD	Operating Company	OIL WELLS AT END OF 1946: Year of Discovers	Producing: Shut In	Producing: Flowing	Producing: Art. Lift	Producing: Total Producing	CRUDE OIL PRODUCTION BARRELS: Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
SALTA:										
Agua Blanca	Standard Oil	1924	3		4	4	93	31,299	32,472	1,249,314
Lomitas	Standard Oil	1927	4		32	32	208	92,928	85,592	3,273,944
San Pedro	Standard Oil	1928	3	3	16	19	1,058	473,908	416,181	13,831,348
Ramos	Standard Oil	1937	1		2	2	21	9,339	8,251	57,217
Tartagal	Standard Oil	1927	2		2	2	38	11,475	13,567	82,217
Tranquitas	YPF (1945 data)									
Lomitas	YPF (1945 data)	1927	38	n. a.	n. a.	121	n. a.	665,281	459,170	8,601,028
Rio Pescado	YPF (1945 data)	1933								
Total Salta			51	3	56	180	1,418	1,287,752	1,015,233	27,095,068
NEUQUEN:										
Plaza Huincul	Standard Oil	1924	22	8	86	94	852	382,061	343,960	12,146,585
Plaza Huincul	YPF (1945 data)	n. a.	67	n. a.	n. a.	216	n. a.	1,964,141	1,918,450	16,199,851
Total Neuquen			89	8	86	310	852	2,346,202	2,252,410	28,346,436
CHUBUT: Comodoro Rivadavia District:										
Kilometro 8	Cia. Ferrocarrilera	1915	99		310	310	1,016	556,319	435,614	24,885,083
M. Rosales	Cia. Ferrocarrilera	1922	16		104	104	526	252,833	212,753	7,289,267
Solano	Cia. Ferrocarrilera	1924	31		110	110	581	291,026	216,068	2,738,175
J. Segundo	Cia. Ferrocarrilera	1922	2		21	21	157	54,547	43,307	601,368
Reserva	Cia. Ferrocarrilera	1922	9		4	4	17	1,183	1,679	127,102
Sindicato	Cia. Ferrocarrilera	1928	11		41	41	245	72,901	79,499	929,788
Astra	Astra Compania	1914	40		268	268	2,032	967,578	850,821	22,979,445
Kilometro 27	Diadema Argentina	1924	17		356	356	10,799	4,214,709	3,840,844	59,712,744
C. Rivadavia Fields	YPF (1945 data)	n. a.	144	n. a.	n. a.	2,136	n. a.	9,722,422	8,648,750	166,104,339
Total Chubut			379		1,214	3,350	15,373	16,130,429	14,329,335	285,367,311
MENDOZA:										
Mendoza Fields	YPF (1945 data)	n. a.	6	n. a.	n. a.	84	n. a.	3,102,020	2,987,750	22,402,909
Sosneado	El Sosneado	n. a.	13	n. a.	n. a.	17	n. a.	14,999	9,001	364,528
Total Mendoza			19			101		3,117,019	2,996,751	22,767,437
Total Argentina			538	11	1,356	3,941		22,881,402	20,593,729	363,576,252

n. a. Indicates data not available.

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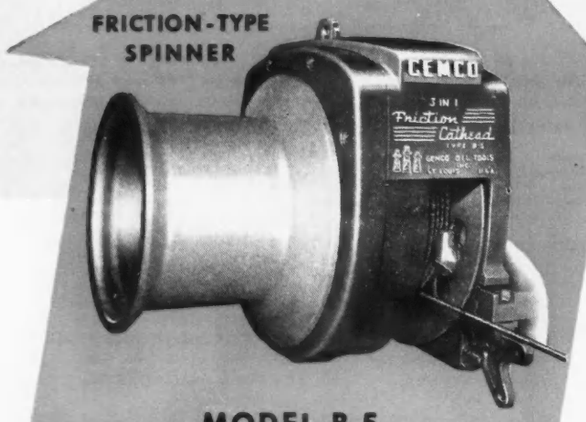

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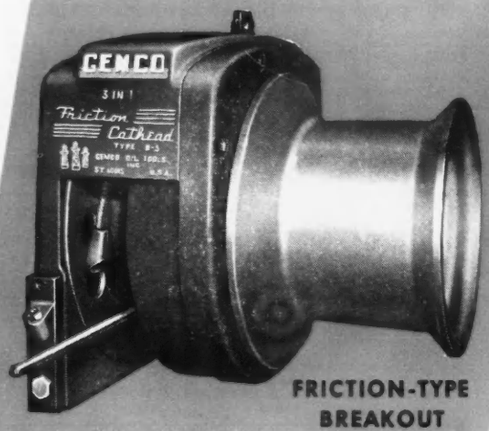
MODEL B-5



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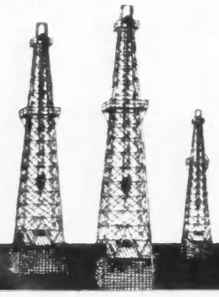

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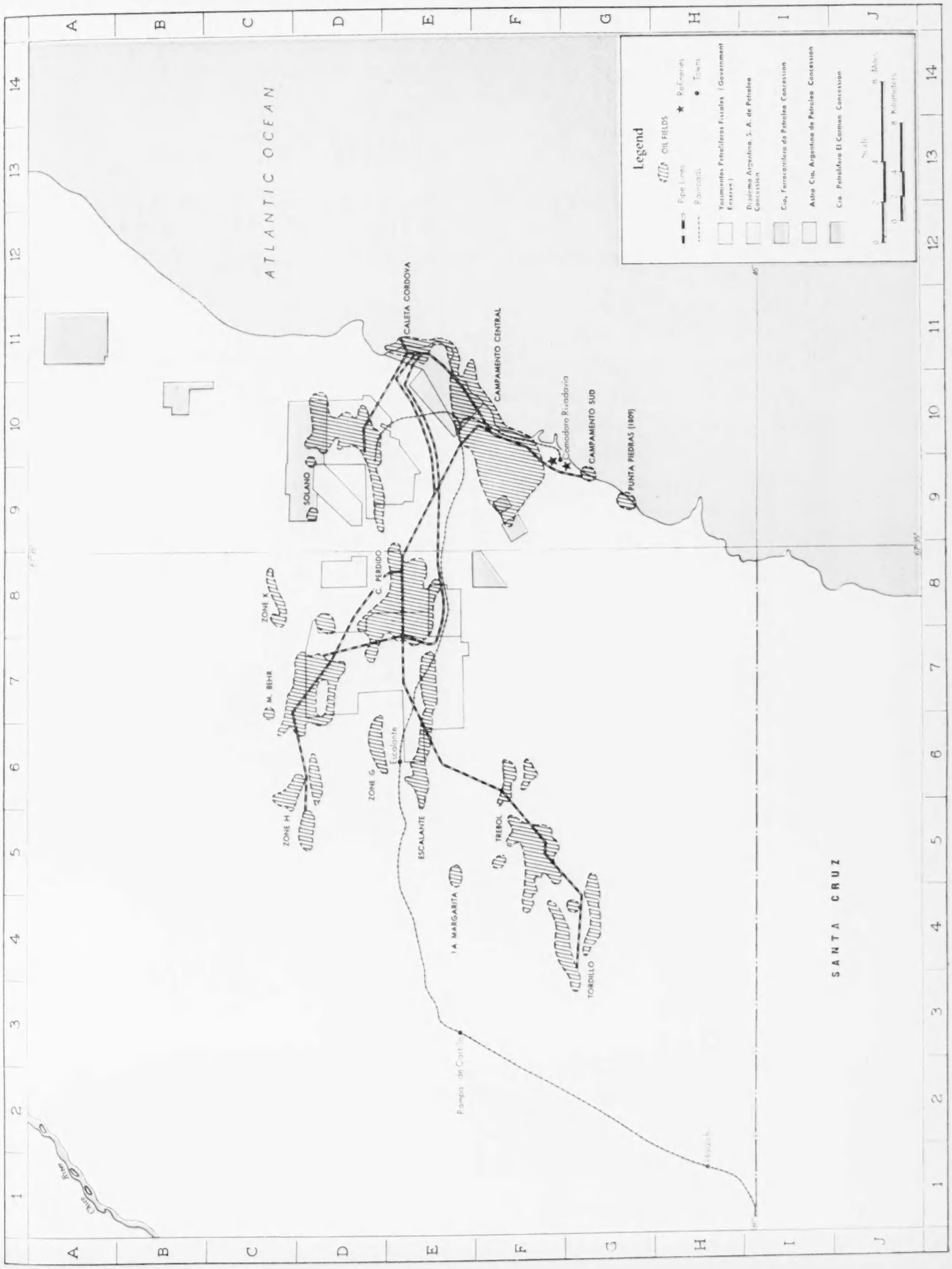
ARGENTINA—Chubut (Comodoro Rivadavia) Fields and Concessions



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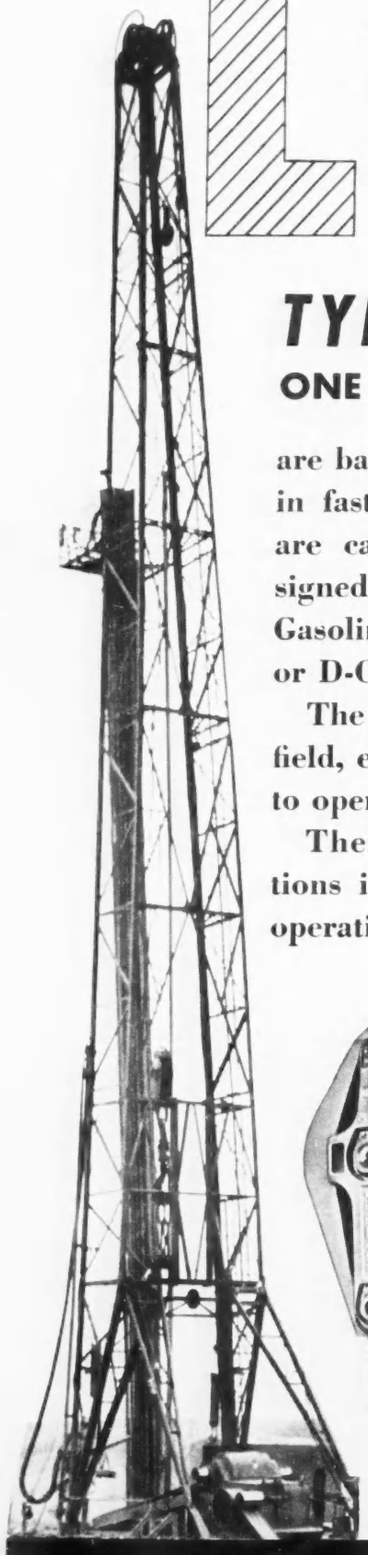

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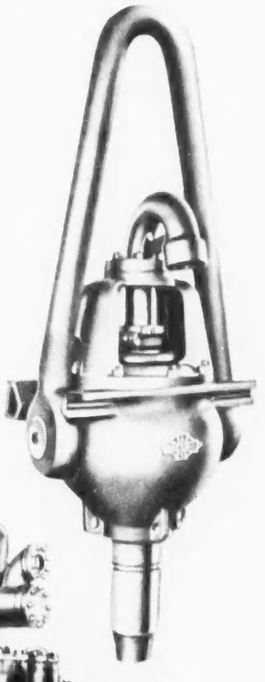

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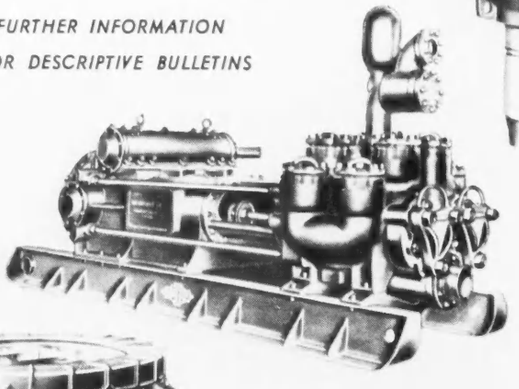

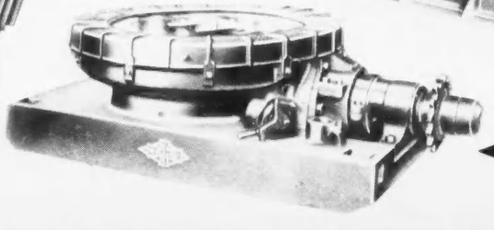

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ARGENTINA—Continued

Mendoza Province; Salta, in Salta Province, and Plaza Huincul, in Neuquen Province. Another area, the Caleta Olivia field, discovered by YPF during the war, is situated in Santa Cruz Province.

Comodoro Rivadavia, which stretches along the southern Atlantic coast, comprises many separate pools and is the country's largest producing area. There are four operating companies in this district with YPF the largest and most active. Others are Diadema Argentina S.A. de Petroleo (Shell); "Astra" Compania Argentina de Petroleo S.A. (an Argentina company) and Compania Ferrocarrilera de Petroleo (British Railways).

During 1946, Comodoro Rivadavia district produced 14,338,335 barrels of oil, or about two thirds of Argentina's output. Of this amount, YPF accounted for 8,648,750 barrels and private companies 5,689,585 barrels. During the year, private companies completed 111 wells in this district, including 16 wildcats and outposts drilled by Cia. Ferrocarrilera. Information regarding YPF's drilling activities during 1946 is not available but in 1945 the government drilled 40 tests in this district.

Mendoza, where output totaled an estimated 2,996,751 barrels in 1946, is the second largest producing area. With the exception of a few thousand barrels, all the oil is produced by YPF and during 1945 only seven wells were drilled.

The Plaza Huincul area produced 2,262,410 barrels in 1946 with Standard Oil, the only private company in the field, accounting for 343,960 barrels. During the year Standard completed one oil well and one dry hole in the field and a 4009-foot dry wildcat test.

Salta's production totaled 1,015,233 barrels during the year with Standard Oil's output being 556,063 barrels and YPF's 459,170 barrels. This is the only district where the output of private companies exceeds that of the government company. Standard drilled only one test in this area in 1946 as compared with nine in 1945.

During the year, private companies completed 115 wells and drilled a total of 296,050 feet. This compared with 98 wells and 305,472 feet in 1945. Although information on YPF for 1946 is not available, the government company completed 224 wells in 1945 and drilled 708,973 feet. Private companies had 1384 wells producing at the end of 1946 while YPF had 3922 producing wells at the end of 1945.

Refineries

Argentina has 18 crude oil refineries with a total crude charging capacity of slightly more than 100,000 barrels daily with the cracking capacity being about 47,000 barrels daily.

The largest refinery is YPF's plant at La Plata which has a daily crude charging capacity of 33,300 barrels. YPF also operates four other plants with the total daily capacity of the five plants being 50,600 barrels.

Wildcats Completed in Argentina in 1946

Province	Company, Well, Location	Date Completed	Total Depth Feet	Results
Neuquen	Standard Oil Company's Poza Neva 1	11-25	4009	Dry.
Chubut	Cia. Ferrocarrilera's Well No. 16, Mina Andes area, north of Comodoro Rivadavia.	4-30	2309	Dry.
Chubut	Cia. Ferrocarrilera's Well No. 17, Mina Andes region.	7-2	1332	Dry.
Chubut	Cia. Ferrocarrilera's Well No. 18	8-24	1194	Gas well in Pehuenche formation.
Chubut	Cia. Ferrocarrilera's Well No. 17 in Mina Chubut (Solano) area, north of Comodoro Rivadavia.	3-16	2132	Oil producer in Continental formation.
Chubut	Cia. Ferrocarrilera's Well No. 619, in Mina Kilometro 8 region, northeast of Comodoro Rivadavia.	1-22	1968	Oil producer in Glauconitico formation.
Chubut	Cia. Ferrocarrilera's Well No. 620, Mina Kilometro 8 region.	5-2	1970	Dry.
Chubut	Cia. Ferrocarrilera's Well No. 621, Mina Kilometro 8 region.	5-13	1975	Dry.
Chubut	Cia. Ferrocarrilera's Well No. 622, Mina Kilometro 8 region.	5-10	1971	Oil producer in Glauconitico formation.
Chubut	Cia. Ferrocarrilera's Well No. 623, Mina Kilometro 8 region.	5-15	1968	Dry.
Chubut	Cia. Ferrocarrilera's Well No. 624, Mina Kilometro 8 region.	5-23	1971	Oil producer in Glauconitico formation.
Chubut	Cia. Ferrocarrilera's Well No. 632, Mina Kilometro 8 region.	9-23	853	Gas producer in Pehuenche formation.
Chubut	Cia. Ferrocarrilera's Well No. 633, Mina Kilometro 8 region.	10-5	541	Gas producer.
Chubut	Cia. Ferrocarrilera's Well No. 635, Mina Kilometro 8 region.	10-21	558	Gas producer.
Chubut	Cia. Ferrocarrilera's Well No. 637, Mina Kilometro 8 region.	12-14	2027	Dry.
Chubut	Cia. Ferrocarrilera's Well No. 638, Mina Kilometro 8 region.	12-31	663	Dry.
Chubut	Cia. Ferrocarrilera's Well No. 307, in M. Rosales region, west of Comodoro Rivadavia.	12-10	5130	Dry.

Note: No wildcat tests were drilled by Astra and Diadema in 1946. Wildcat drilling data on YPF not available.

Drilling in Argentina

PROVINCE AND FIELD	Operating Company	Wells Completed in 1945					Wells Completed in 1946					Field Wells Drilling and Shut Down at End of 1946		
		Oil	Gas	Dry	Total Wells	Total Footage	Oil	Gas	Dry	Total Wells	Total Footage	Dr	SD	Total
SALTA: Total		4		5	9	28,091	1			1	1,288	1	3	4
Lomitas	Standard Oil			4	4	7,455	1			1	1,288		1	1
San Pedro	Standard Oil	1		1	2	6,519						1	2	3
Agua Blanca	Standard Oil													
Ramos	Standard Oil													
Cerro Tartagal	Standard Oil													
Tranquitas	YPF	2			2		n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
Lomitas	YPF					14,117	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
Rio Pescado	YPF	1			1		n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
NEUQUEN: Total		15	3	2	20	59,988	1		2	3	9,221	1		1
Plaza Huincul	Standard Oil	1		2	3	8,950	1		1	2	5,212	1		1
Plaza Huincul	YPF	14	3		17	51,038	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
Wildcats	Standard Oil								1	1	4,009			
CHUBUT: Total		107	2	18	127	461,216	80	9	22	111	285,541	7	5	12
Comodoro Rivadavia District	Cia. Ferrocarrilera	29		7	36	105,695	31	4	11	46	89,964	3		3
	Astra Compania	18			18	61,142	17		2	19	60,987	2	1	3
	Diadema Argentina	28			28	98,010	28	1	1	30	106,328	2	4	6
	YPF	32	2	6	40	179,672	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
	Cia. Ferrocarrilera			5	5	17,297	4	4	8	16	28,562			
Wildcats														
MENDOZA: Total		7			7	32,123	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
Mendoza	YPF	5			5	31,119	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
Sosneado	El Sosneado	2			2	1,004	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
SANTA CRUZ: Total		2			2	9,765	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
Caleta Olivia	YPF	2			2	9,765	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.
Total Argentina		135	5	25	165	591,184	82	9	24	115	296,050	9	8	17

Data by companies, not fields. n. a. Indicates data not available.

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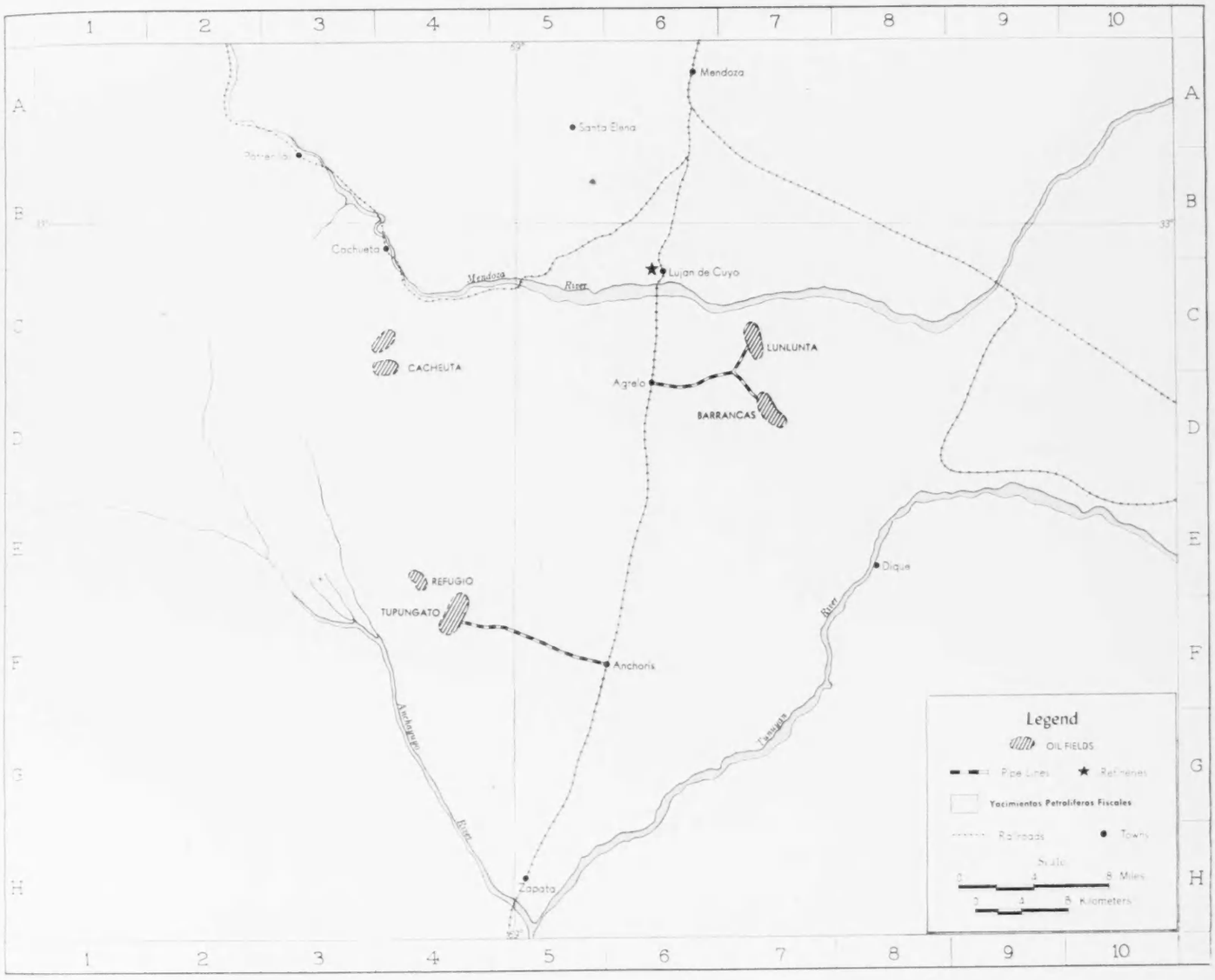
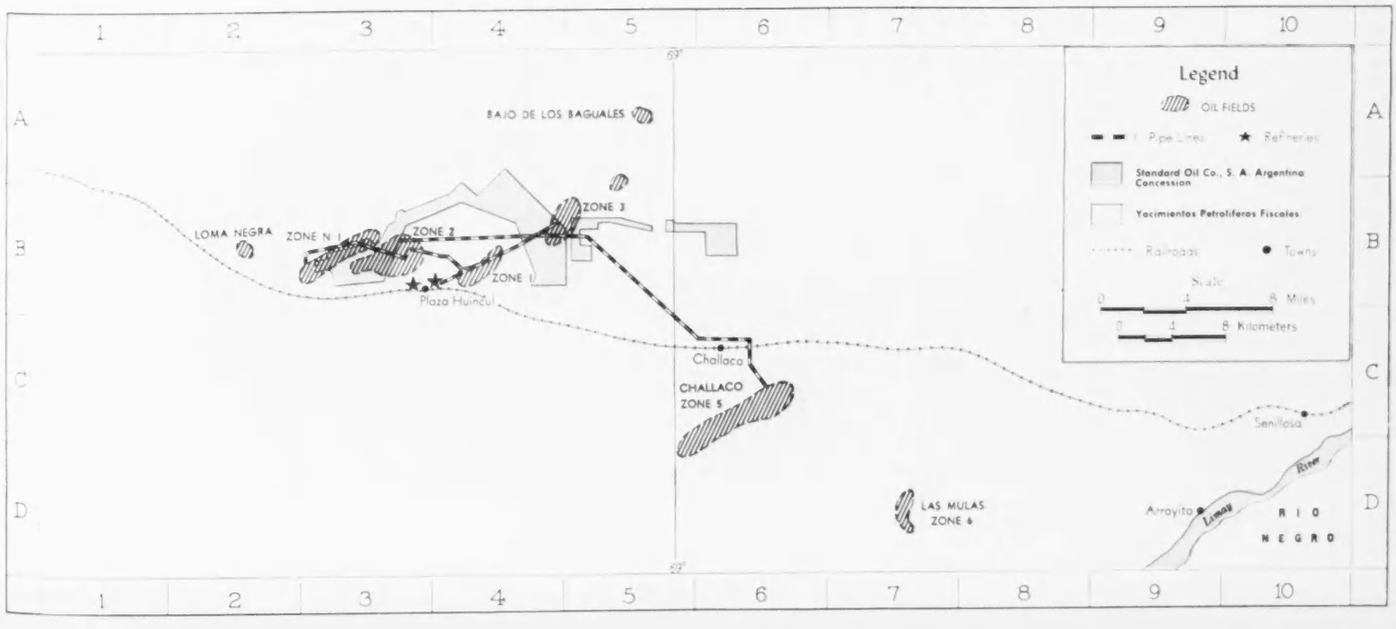
ARGENTINA—Mendoza Fields and Concessions



Neuquen (Plaza Huincul) Fields and Concessions



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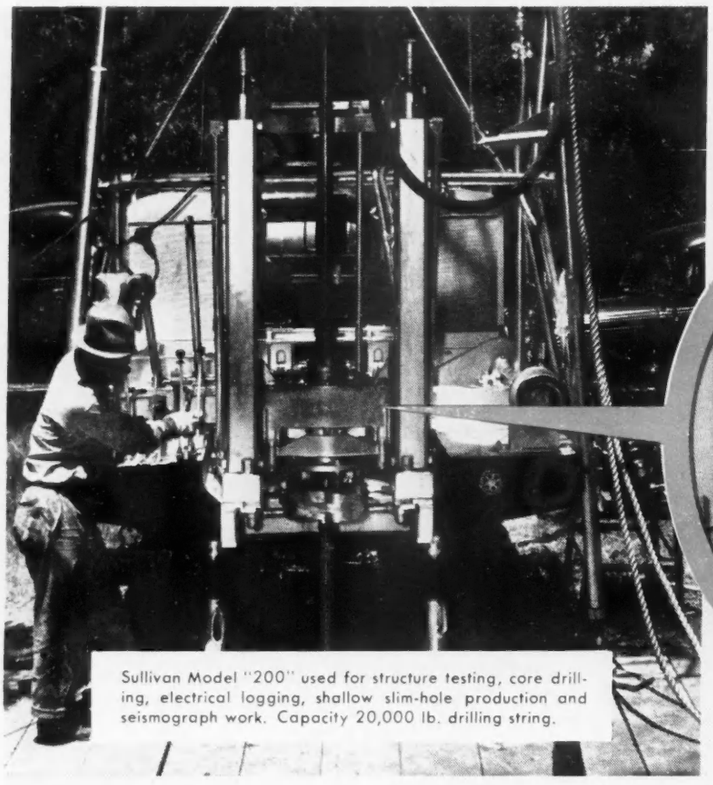

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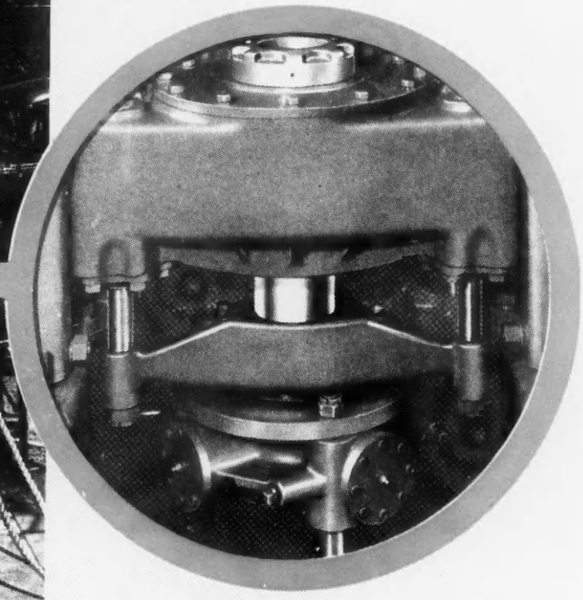

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ARGENTINA—Continued

Other large refineries in Argentina are operated by Cia. Nativo de Petroleos at Campana and by Diadema (Shell) at Buenos Aires, the principal refining center in the country.

Mineral Ownership

After commercial oil production had been developed by private companies in several areas of Argentina, the government organized Yacimientos Petroliferos Fiscales (subsequently incorporated by an Act of Congress in 1932), which entered the oil business. By decree, reserve areas open only to YPF were established.

This made it impossible for private companies to procure additional concessions. Consequently, only those companies holding concessions at that time now operate in Argentina, and the oil business is primarily in the hands of YPF.

Data on Argentina Refineries

COMPANY	Location of Plant	Crude Charging Capacity Bbls. Daily	Cracking Capacity Bbls. Daily	Type of Refinery	Operating Status
Cia. Nativa de Petroleos	Campana	16,000	8,000	Complete	Operating
Diadema Argentina S.A. de Petroleo (B.P.M.-Shell)	Puerto Galvan	3,000	1,850	Skim-Crk.	Operating
	Dock Sud-Avellaneda (Buenos Aires)	12,000	8,000	Skim-Crk.	Operating
Condor Soc. Anon. Petrol. Argentina	Avellaneda (Buenos Aires)	750	None	Skim-Lube	Operating
Lottero-Papini y Cia.	Avellaneda (Buenos Aires)	630	None	Skim-Lube	Operating
Cia. "La Isaura", S.A.	Bahia Blanca	2,200	None	Skim.	Shut Down
Standard Oil Co. S.A. Arg.	Manuel Elordi	1,000	None	Skim.	Operating
	Plaza Huincul	315	None	Skim.	Operating
Ultramar S.A. Petroleo Argentina	Avellaneda (Buenos Aires)	5,400	2,850	Complete	Operating
Cia. General Asfaltos	Wilde (Buenos Aires)	500	None	Skim-Lube	Operating
"Astra" Compania de Petroleo, S.A.	Comodoro Rivadavia	2,500	None	Skim.	Shut Down
Compania Ferrocarrilera de Pet.	Comodoro Rivadavia	5,700	2,000	Skim-Crk.	Operating
	La Plata	33,300	23,000	Complete	Operating
	San Lorenzo	10,100	None	Comb. Unit	Operating
Yacimentos Petroliferos Fiscales YPF	Lujan de Cuyo	3,800	1,000	Comb. Unit	Operating
	Chachapoyas	1,900	None	Comb. Unit	Operating
	Plaza Huincul	1,500	None	Skim.	Operating
Soc. Anon. Com. e'Indust. "Razor"	Quilmes (Buenos Aires)	150	None	Skim. Lube	Operating
Total	18 plants	100,745	46,700		

Crude Oil Pipe Lines of Argentina

Area and Company	Origin	Terminus	Length Miles	Diameter Inches	Capacity of Line Bbls. Daily
Chubut					
YPF	El Tordillo	El Trebol	3.7	8	15,725
YPF	El Trebol	Escalante	6.8	8	18,870
YPF	Escalante	Canadon Perdido	8.9	8-10	22,000
YPF	Canadon Perdido	Km. 9	5.8	7-8 9-10	28,300
YPF	Km. 9	Caleta Cordova	6	8	25,160
YPF	Km. 9	Km. 5	3.5	9-10	25,160
YPF	Km. 5	Km. 3	2.3	8-10	25,160
YPF	Campamento Sur	Km. 3	2.7	5	6,290
YPF	Manantiales Behr	C. Perdido	8.9	6-8	12,580
Astra	Field	C. Cordova	4.8	8	21,385
Astra	Km. 23	Field	9.3	6	12,580
Diadema	Km. 27	Caleta Olivares	23.7	6	12,580
Ferrocarrilera	Manantial Rosales	Km. 8	7.5	6	12,580
Ferrocarrilera	Km. 8	C. Cordova	4.7	6	12,580
Ferrocarrilera	Km. 8	Km. 3	3.7	6	12,580
Ferrocarrilera	Mina Solano	Km. 8	18.6	6	12,589
Neuquen					
YPF	Field	Est. Challaco	3.9	4-6	9,400
Standard Oil Co.	Field	Est. Challaco	9.3	3	3,100
Mendoza					
YPF	Tupungato	Est. Anchoris	10.4	8	18,870
YPF	Barrancas	Agrelo	9.3	3-4	3,100
Salta					
YPF	Rio Pescado	Oran	16.8	4	3,775
YPF	Tranquitas	Vespucio	3.7	3	1,885
Standard Oil Co.	Agua Blanca	Elordi	41.5	3	1,000
Standard Oil Co.	San Pedro	Lomitas	16.3	4	5,150
Standard Oil Co.	Lomitas	Vespucio	3.8	4	5,150
Standard Oil Co.	Vespucio	Hickman	36	4-5-6	5,000
Standard Oil Co.	Hickman	Elordi	37	4	2,200

Engineering and Geological Data on Argentina Fields

PROVINCE AND FIELD	Est. Proved Area Acres	Gravity Oil API	PRODUCING FORMATION Local Name	Kind	Geologic Age	Depth of Wells Feet: Minimum to Top of Pay	Depth of Wells Feet: Maximum Total Depth of Wells	Average Thickness of Pay Ft.	Type Structure
SALTA:									
Agua Blanca	40	22.5	Gondwana Inf.	Sand	Permian	2300	3600	33	Anticline
Tartagal	40	45	Gondwana Inf.	Limestone, Sand	Permian				Anticline
Lomitas	550	43	Tarija	Lime	Permian				Anticline
Ramos	30	54	Devonico	Sand	Devonian	2900	3950	30	Faulted Anticline
San Pedro	494	43	Gondwana Inf.	Sand	Permian	1800	3300	60	Anticline
Rio Pescado		49	Terciario	Sand	Tertiary	4175	4376	103	Anticline
NEUQUEN Plaza Huincul District:									
Huincul	2172	29.2	Dogger	Sand	Jurassic	2230	2580	26	Anticline
Dadin	325	32.5	Dogger	Sand	Jurassic	1990	2320	40	Stratigraphic trap
Centro Octogono	150	32	Dogger	Sand	Jurassic	1880	1950	40	Monocline
Oesta Octogono	1800	31.5	Dogger	Sand	Jurassic	2300	2365	33	Monocline
Laguna Colorada	510	33.5	Dogger	Sand	Jurassic	2450	2610	56	Monocline
Bajo de los Baguales	60	38.5	Dogger	Sand	Jurassic	3383	3386	20	Monocline
Challaco	875	22.5	Dogger	Sand	Jurassic	3300	3425	66	Faulted Anticline
MENDOZA:									
Sosneado	150	12.9	Victor	Sand	Triassic	544	551		Monocline
Tupungato	250	30	Victor	Sand	Triassic	5870	6310	69	Anticline
Cacheuta	700	31	Victor C.y Potrerillos	Sand	Triassic	1940	3080	13	Monocline
Lagunita Barrancas		28	Potrerillos	Sand	Triassic	7720	7890	45	Anticline
CHUBUT Comodoro Rivadavia District:									
Costa	13,175	20	Glauconitico	Sand	Upper Cretaceous	1815	2805	30	Faulted Anticline
Escalante	17,700	23.5	Glauconitico	Sand	Upper Cretaceous	2290	4290	33	Faulted Anticline
Campamento Sud	200	29	Glauconitico	Sand	Upper Cretaceous	1917	2300	26	Anticline
Col. Sarmiento	20	23	Glauconitico	Sand	Upper Cretaceous	2310	2640	26	Faulted Anticline
El Trebol	10,250	23	Glauconitico	Sand	Upper Cretaceous	3878	5950	33	Faulted Anticline
Kilometro 27	8,975	24	Glauconitico	Sand	Upper Cretaceous	3088	3372	26	Anticline
Kilometro 8	3,900	19	Glauconitico	Sand	Upper Cretaceous	1675	1965	50	Faulted Anticline
M. Rosales	730	19	Glauconitico	Sand	Upper Cretaceous	1975	3900	26	Faulted Anticline
Segundo	93	19	Glauconitico	Sand	Upper Cretaceous	2300	3970	30	Anticline
Solano	5,000	20.6	Glauconitico	Sand	Upper Cretaceous	1540	2920	35	Faulted Anticline
Reserva	75	19.5	Glauconitico	Sand	Upper Cretaceous	1750	1985	15	Anticline
Sindicato	415	19	Glauconitico	Sand	Upper Cretaceous	2965	3130	15	Anticline
Astra	2,965	22.3	Glauconitico	Sand	Upper Cretaceous	1740	3280	50	Faulted Anticline
SANTA CRUZ:									
Caleta Olivia		30.6		Sand	Jurassic	4085	5612	10	Faulted Anticline

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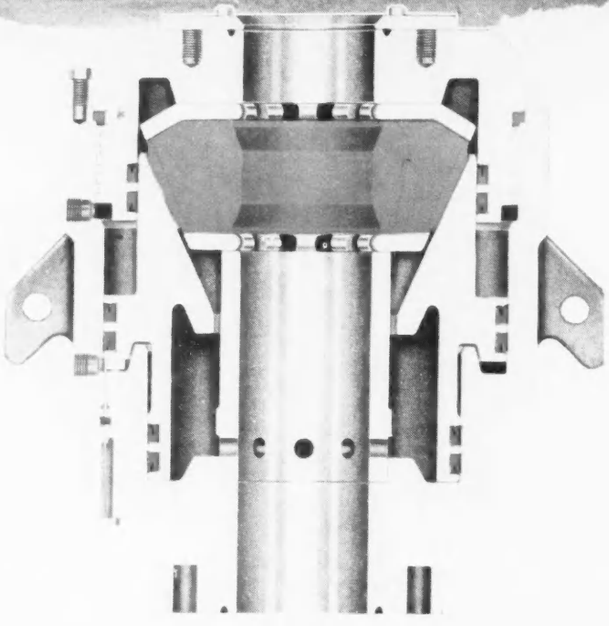

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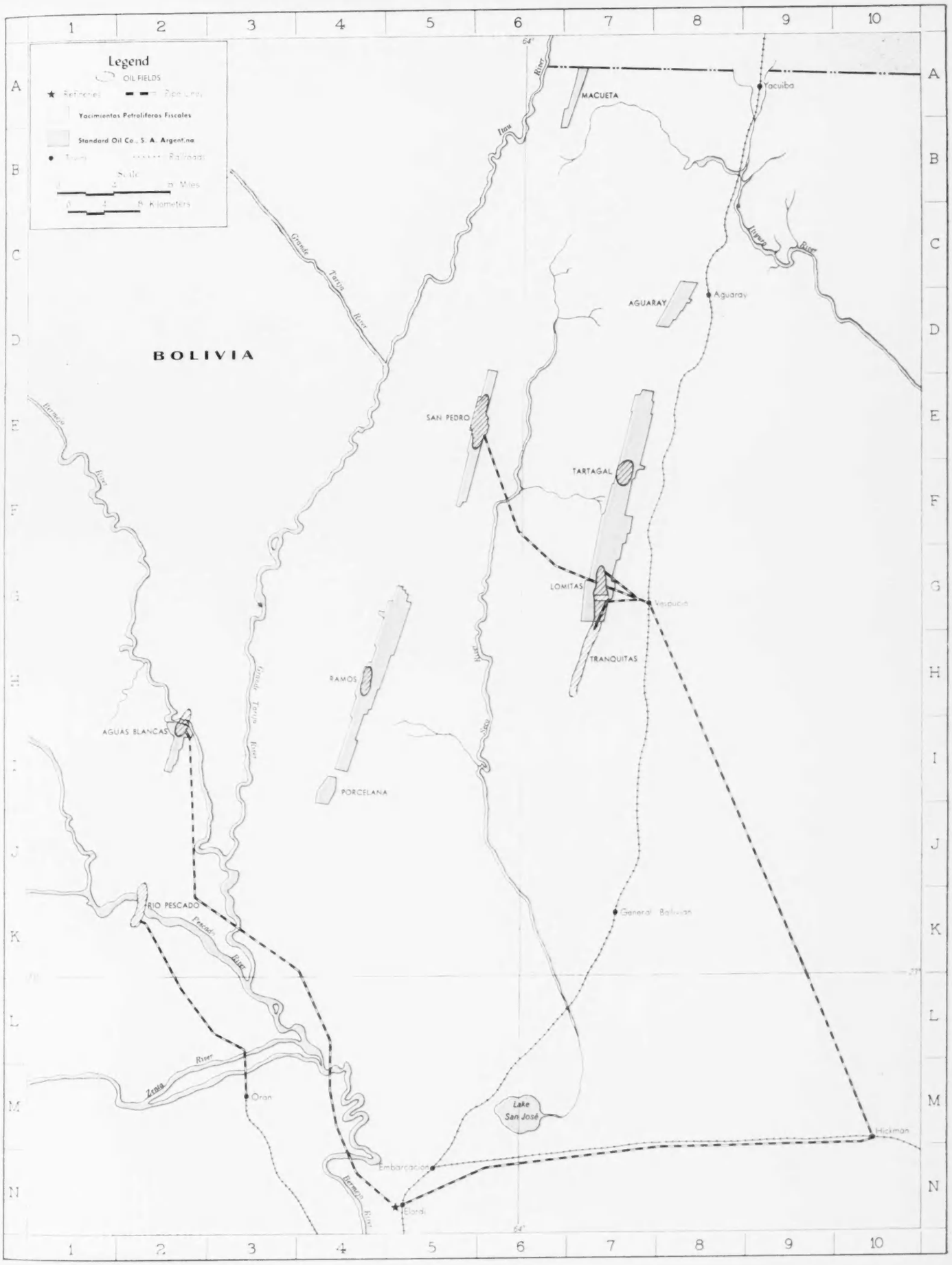

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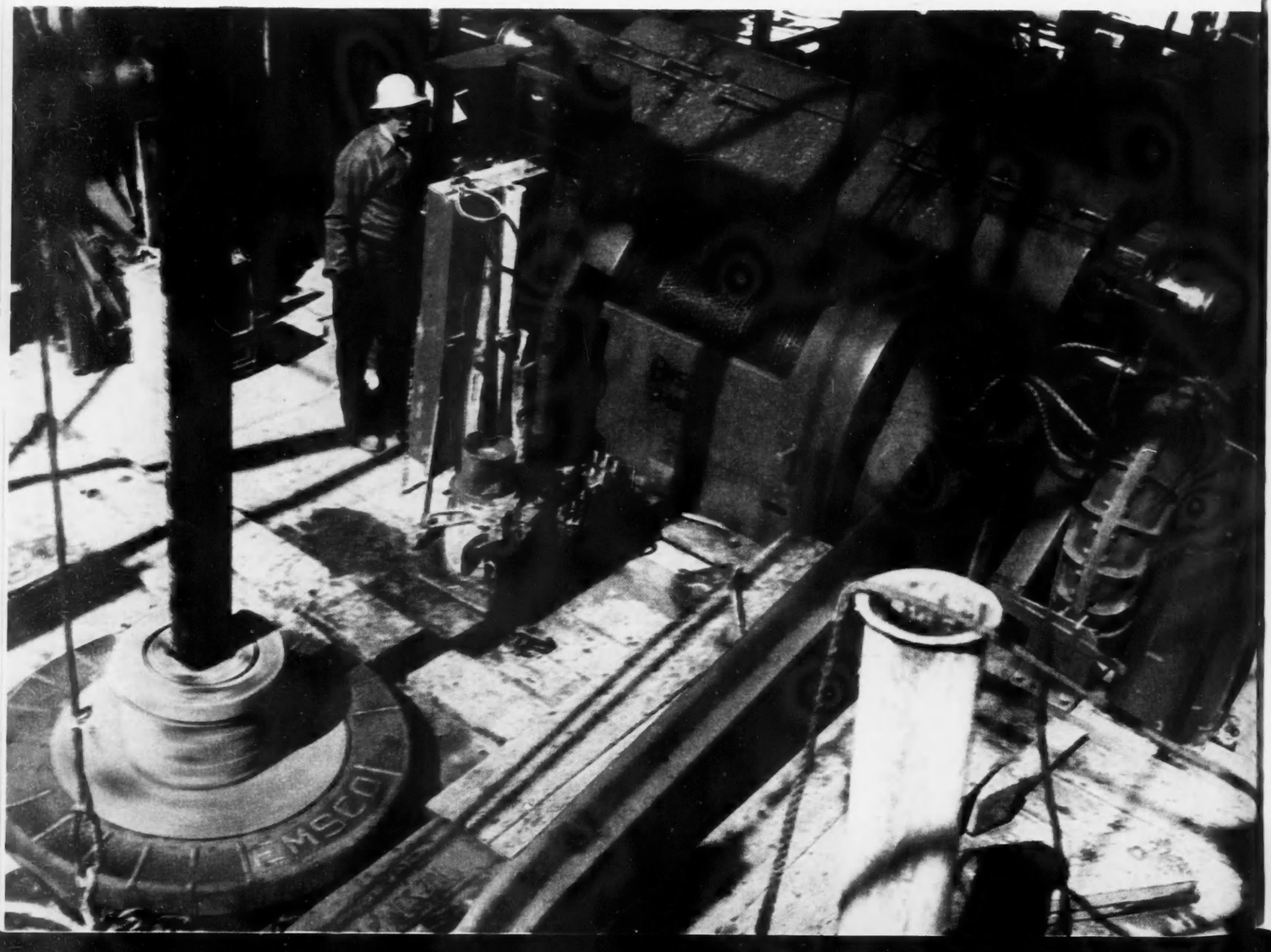

BOLIVIA

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100 Kilometers
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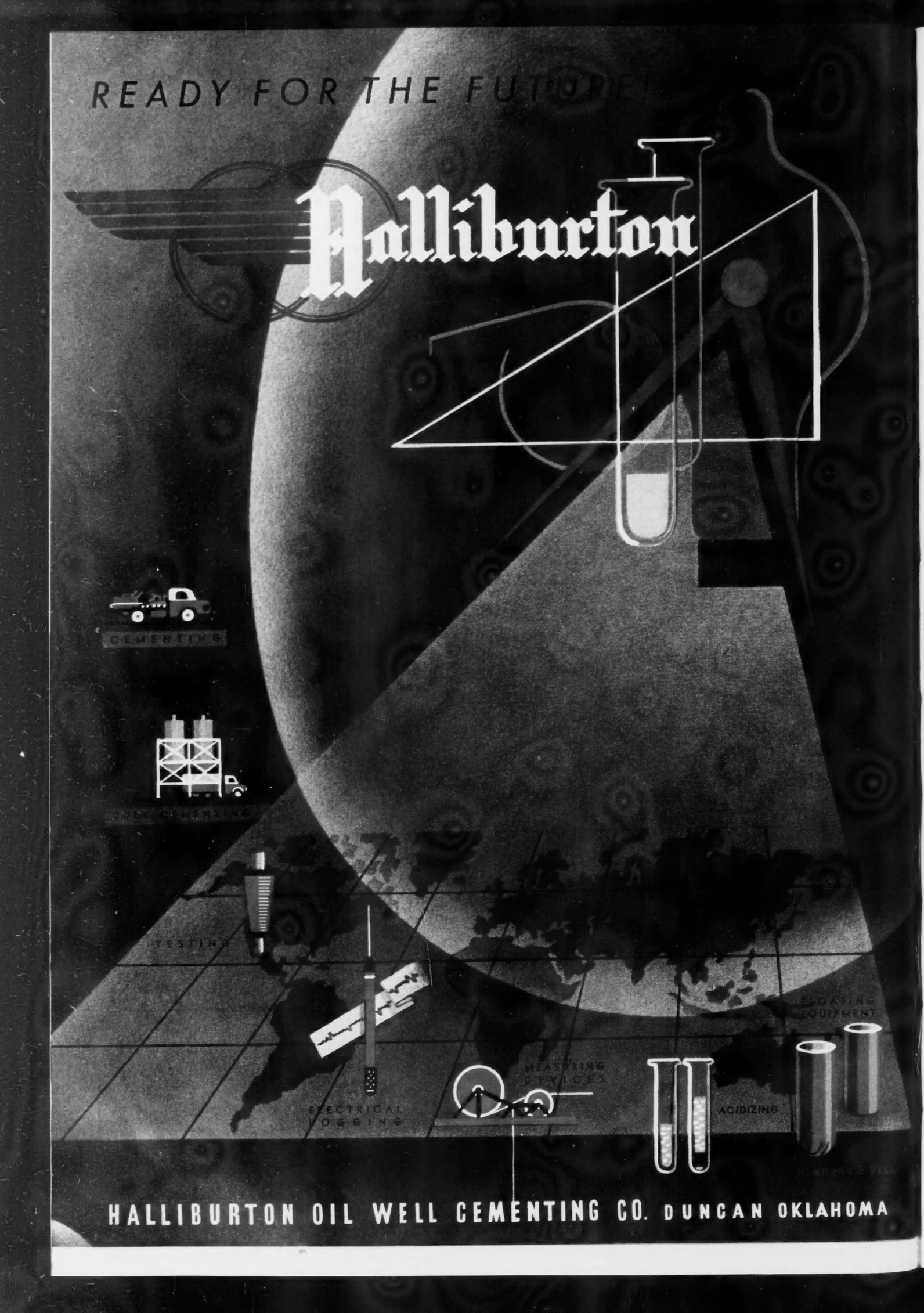
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BOLIVIA

ALTHOUGH Bolivia's crude oil production during 1946 decreased sharply, plans are taking shape to expand the industry. Output in 1946 amounted to 346,109 barrels as compared with 381,655 barrels in 1945.

Expansion plans call for the drilling of 50 wells in the Camiri field; drilling of 20 wildcat tests; construction of a 6-inch pipe line from the Camiri field to Tintin via Zudanez, a distance of 240 miles with a 100-mile branch line from Zudanez to Sucre; possible extension of the trunk line from Tintin to Capinota and other points near Cochabamba, and the construction of refineries at Sucre and Cochabamba.

Contract for the drilling of the 50 wells in the Camiri field has been concluded with an American firm. The topping plant at Sucre will have a capacity of 200 barrels daily while the topping and reforming unit at Cochabamba will have a capacity of 3000 barrels daily.

The two pipe lines, now under construction, when completed will have a capacity of 8000 barrels daily each. First wildcat drilling under the new program is getting under way on structures at Guayruy and Mandeyapecua.

During 1946 there were two oil wells completed in the Sanandita field and one at Camiri with total footage amounting to 5126 feet. At the end of the year, Camiri had seven rigs active, three were running in Sanandita and one at Bermejo.

The government has issued a decree lifting the prohibitions on the exploitation of the country's petroleum reserves and throwing certain zones open to development by private capital under director or contract with YPFB. A contract has been signed by YPFB and the Superior Oil Company of California granting the latter concern exploration and exploitation rights in certain of Bolivia's petroleum reserves.

The cooperation of Guillermo Mariaca, Gerente General, Yacimientos Petroliferos Fiscales Bolivianos, is gratefully acknowledged.

Drilling in Bolivian Fields

Field and Province	Wells Completed in Fields in 1946					Field Wells Drilling, and Shut Down at End of 1946		
	Oil	Gas	Dry	Total Wells	Total Footage	Dr	SD	Total
Bermejo, Tarija						1		1
Camiri, Santa Cruz	1			1	266	7		7
Sanandita, Tarija	2			2	4860	3		3
Totals	3			3	5126	11		11

Producing Oil Wells and Crude Oil Production of Bolivia

Province and Field	Year of Discovery	Oil Wells at End of 1946				Crude Oil Production (Barrels)		
		Producing						
		Shut in	Flowing	Art. Lift	Total Producing	Year, 1945	Year, 1946	Cumulative Through 1946
Santa Cruz								
Camiri	1927	2	3	2	5	121,448	112,287	1,385,067
Tarija								
Bermejo	1927	2	4	1	5	160,485	123,971	644,897
Sanandita	1926	2	3	11	14	99,722	112,851	1,442,871
Totals		6	10	14	24	381,655	346,109	3,472,833

Engineering and Geological Data on Bolivia Oil Fields

FIELD and PROVINCE	Est. Proved Area (Acres)	Gravity of Oil API	PRODUCING FORMATION					
			Local Name	Kind	Geologic Age	Depth of Wells (Ft.) Minimum Top Pay	Depth of Wells (Ft.) Maximum Total Depth	Type Structure
Bermejo, Tarija	600	25.7	Tarija	Sand	Permo-Triassic	2214	3630	Anticline
[1]Buena Vista, Chuquisaca	1475	43.5		Sand	Devonian		3165	Elongated Dome Anticline
[1]Caigua, Chuquisaca								
[1]Camatindi, Chuquisaca	1120	41.5		Sand	Devonian	2350	4800	Faulted Anticline
Camiri, Santa Cruz	640	53.1	Iquiri	Sand	Devonian		3200	Anticline
[1]Saipuru, Santa Cruz	740	40		Sand	Devonian	500		Anticline
Sanandita, Tarija	200	41.5	Totora	Sand	Permo-Triassic	2000	2100	Anticline

[1] Non-producing Fields.

BRAZIL

FACED with inadequate refining facilities and pipe line outlets, Brazil's crude oil production during 1946 dropped sharply. Output of the five producing areas totaled 67,224 barrels as compared with 79,263 barrels in 1945.

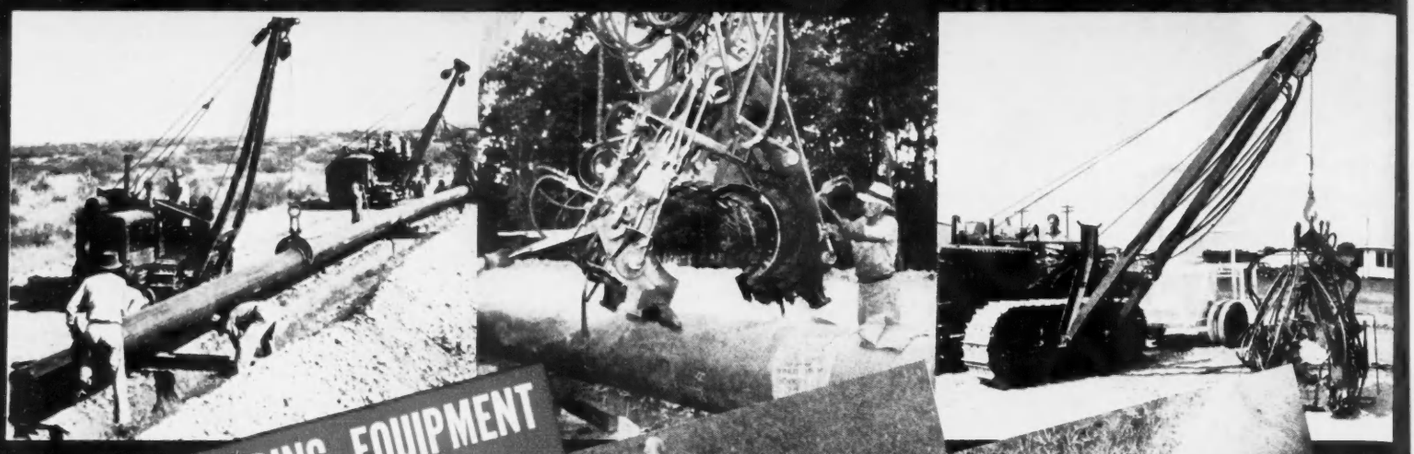
Accounting for most of the production was the Candeias field in the State of Bahia. At the end of the year, this field had nine producing wells flowing an estimated 176 barrels daily. Total production of the field in 1946 was 52,603 barrels. This field was enhanced during the year by the completion of Wells Nos. C-26 and C-28. The C-26 was completed on September 25, 1946, in sand at 2296-2483 feet with a total depth of 2532 feet. With oil string set just below the top of the pay, the well flowed 1797 barrels of oil on the first 24-hour gauge through a ¾-inch valve. The C-28 was completed in sand at 1930-2466 feet with total depth being 2560 feet. On a 24-hour gauge the well flowed 1032 barrels of oil through a ¾-in. valve. Both wells were shut in.

A new producing field was opened during 1946 with the completion of a wildcat well in the Pitanga area, north of the previous fields in the State of Bahia. This well was first placed on production in April, 1946, and during the month produced 89 barrels. A second test is reported being drilled.

The Itaparica field produced only 9764 barrels during 1946 and was shut in at the end of the year. In 1945, the production totaled 29,154 barrels. The Aratu field had two wells producing at the end of the year and output in 1946 totaled 4540 barrels and compares with 6717 barrels produced in 1945. The Lobato field was shut in throughout 1946.

With at least one well flowing in each of its five fields, Brazil's production during January, 1947, totaled 8798 barrels, a sharp increase from the 5790 barrels produced in December, 1946. Candeias' output was stepped up to 7830 barrels for the month with 12 wells producing while the Lobato field accounted for 533 barrels. This was the first monthly production reported for the Lobato field since about mid-1945.

With oil production held to the minimum because of the lack of outlets, plans are under way for the construction of new refineries in Brazil. The Conselho Nacional do Petroleo



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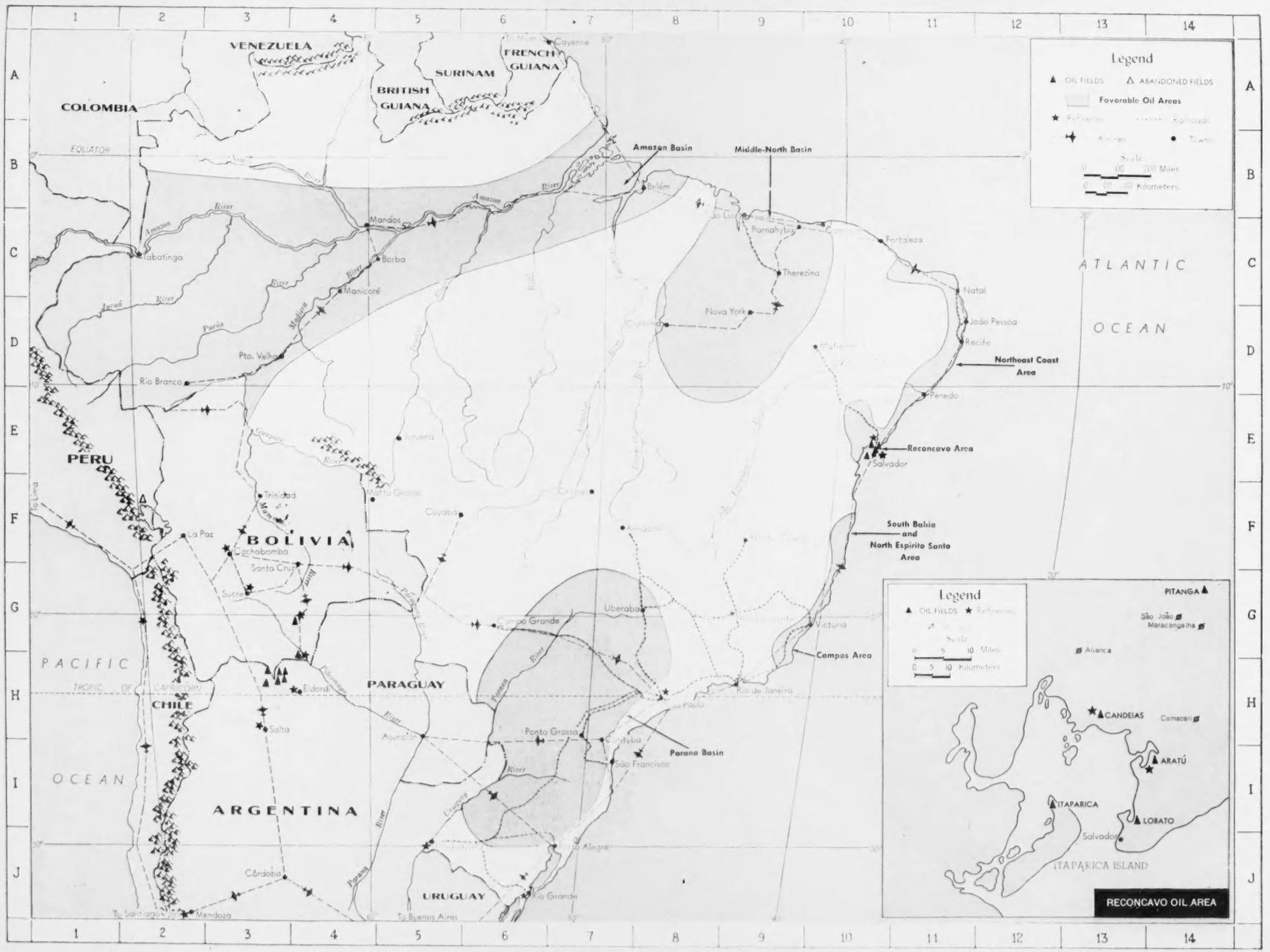
VENEZUELA
COLOMBIA
SURINAM
FRENCH GUIANA
BRITISH GUIANA
EQUATOR
Amazon Basin
Middle-North Basin
Belém
Manáos
Tabatinga
Borba
Manicoré
Pto. Velho
Rio Branco
Parnahyba
Fortaleza
Therezina
Nova York
Natal
João Pessôa
Recife
Northeast Coast Area
Penedo
Reconcavo Area
Salvador
South Bahia and North Espirito Santo Area
ATLANTIC OCEAN
PERU
BOLIVIA
Trinidad
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Santa Cruz
Sucre
Cuyaba
Uberaba
Victoria
Campos Area
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BRAZIL

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BRAZIL—Continued

(Brazil's National Petroleum Council) is preparing to proceed at once with the construction of a 2500-barrel daily capacity refinery in Bahia in the vicinity of the oil fields.

The Council has authorized four separate Brazilian financial groups to present proposals for construction of four new refineries. Two plants, one of 10,000-barrel daily capacity and one of 6000-barrel daily capacity, are slated to be built in Sao Paulo. The other two proposed plants, each of 8000-barrels daily capacity, are slated for Rio de Janeiro.

The Brazilian government also has authorized the creation of a Brazilian Oil Pipe Line Study Commission to make a study of pipe line transportation from the Port of Santos to the city of Sao Paulo to serve the proposed refineries.

Producing Wells and Oil Production of Brazil

Field, Province	Year of Discovery	OIL WELLS AT END OF 1946: Shut in	Producing: Art. Lift	Producing: Total Producing	CRUDE OIL PRODUCTION (Barrels): Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
Bahia								
Lobato	1939	5			Shut in	6,729	Shut in	55,262
Candeias	1941	4	9	9	176	36,603	52,603	133,079
Aratu	1941		2	2	12	6,717	4,540	49,517
Itaparica	1941	7			Shut in	29,154	9,704	52,237
Pitanga	1946	1			Shut in		317	317
Totals		17	11	11	188	79,263	67,224	290,412

Refineries in Brazil

COMPANY	Location of Plant	Crude Charging Capacity (Barrels Daily)	Cracking Capacity (Barrels Daily)	Type of Refinery	Operating Status
Industrias Matarazzo de Energia S.A.	Sao Caetano	800	None	Skimming	Operating
Ipirango, S.A. Companhia Brasileirra de Petroleos	Rio Grande	1800	None	Skimming	Operating
Cia. Distilaria Riograndense de Petroleo	Uruguayana	250	None	Skimming	Operating
Conselho Nacional de Petroleo (Government)	Aratu Field	150	None	Skimming	Operating
Conselho Nacional de Petroleo (Government)	Candeias Field	150	None	Skimming	Operating
Totals	5 Plants	3150	None		

Engineering and Geological Data on Oil Fields of Brazil

FIELD, PROVINCE	Est. Proved Area (Acres)	Gravity of Oil (API)	PRODUCING FORMATION: Local Name	Kind	Geologic Age	Depth of Wells (Ft.): Minimum Top Pay	Depth of Wells (Ft.): Maximum Total Depth	Average Thickness of Pay (Ft.)	Type Structure (Salt Dome, etc.)
Lobato, **Bahia**		33	Bahia	Sand	Cretaceous	1050	7365		Anticline
Aratu, **Bahia**	100	44	Bahia	Sand	Cretaceous	1486	5816	25	Anticline
Candeias, **Bahia**	1000	26-30	Bahia	Sand	Cretaceous	2300	6008	179	Anticline
Itaparica, **Bahia**	240	29	Bahia	Sand	Cretaceous	3300	5025	100	Anticline

CHILE

EFFORTS of the Corporacion de Fomento de la Produccion to expand the Springhill field, Chile's only oil producing area, located on Isla Grande, Tierra del Fuego, were not too successful during 1946.

So far four tests have been drilled in the Springhill field which was discovered in the latter part of 1945. Two of the wells, including the discovery well, were completed as producers, two were dry holes. A fifth test now is under way.

The Springhill 1 was drilled to 7440 feet and completed in Cretaceous sandstone at 7419-38 feet for an estimated 200 barrels of about 39°-gravity oil daily through a quarter-inch choke. Casing pressure, shut in, was 1400 pounds, and tubing pressure 1250 pounds.

The Springhill 2, located about one-half mile north of the discovery well, was drilled to 10,791 feet and abandoned after missing the discovery sand. The third test, located one-quarter of a mile southwest of the first producer, was completed in 1946 as a gas-oil producer at 7210 feet after running more than 100 feet higher than the pool opener. The well initially showed a high gas-oil ratio and very little oil, but has now started making oil with much better ratios. This well is now estimated good for about 500 barrels of oil daily.

Springhill 4, situated 1500 feet east of Springhill 3, the second producer, was abandoned at 7479 feet. A drill stem test of sands failed to show oil. Springhill 5 is 1100 feet southwest of Springhill 3.

Both producers in the Springhill field are shut in because of lack of storage and transportation facilities. Drilling at Springhill is under the direction of George P. Livermore, Inc., drilling contractor of Lubbock, Texas.

Brunswick Peninsula, site of first drilling in the Magallanes Straits region, was the scene of two active wildcat tests during 1946. The government's Pecket 1 wildcat test, northwest of Punta Arenas, was abandoned at 3279 feet on April 15.

The Canelos 1, southwest of Punta Arenas, was bottomed at 3394 feet where drilling was temporarily suspended because it was impossible to drill further with the cable tool rig. A rotary rig may be moved in to carry the test deeper.

A recently published executive decree authorized Corporacion de Fomento de la Produccion to proceed with the organization of a nationalized petroleum industry to carry down through refining and distribution.

Data on Oil Tests Drilled in Chile

AREA AND WELL[1]	Year Completed	Depth (Feet)	Formation at Bottom	REMARKS
Brunswick Peninsula				
Well No. A	1937	2135	Tertiary	Dry. Some gas shows.
Well No. B	1941	3017	Tertiary	Dry.
Well No. C	1936	4990	Cretaceous	Dry.
Well No. D	1936	5773	Tertiary	Dry.
Well No. E	1931	3838	Tertiary	Abandoned. Made some oil.
Well No. F	1931	2135	Tertiary	Dry.
Well No. G	1930	4560	Tertiary	Dry.
Well No. H		3394		Drilling temporarily suspended.
Well No. I	1946	3279	Tertiary	Dry.
Well No. J	1945	1800		Dry.
Isla Grande, Tierra del Fuego				
Springhill 1	1945	7440		Discovery well of Springhill field. Flowed oil from 7419-38 feet. Well now shutin for lack of storage.
Springhill 2	1946	10791		Dry.
Springhill 3	1946	7210		Gas-oil Producer. Shutin.
Springhill 4	1947	7479		Dry.
Springhill 5				Drilling.

[1] All wells drilled by Chilean government. Letters refer to designation of wells on accompanying map, page 159

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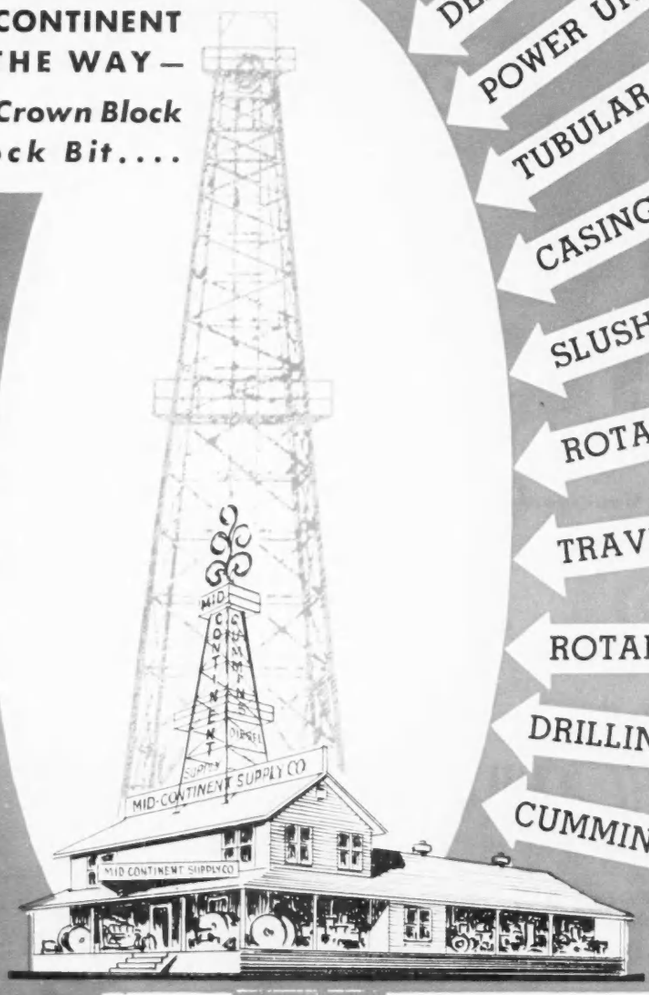

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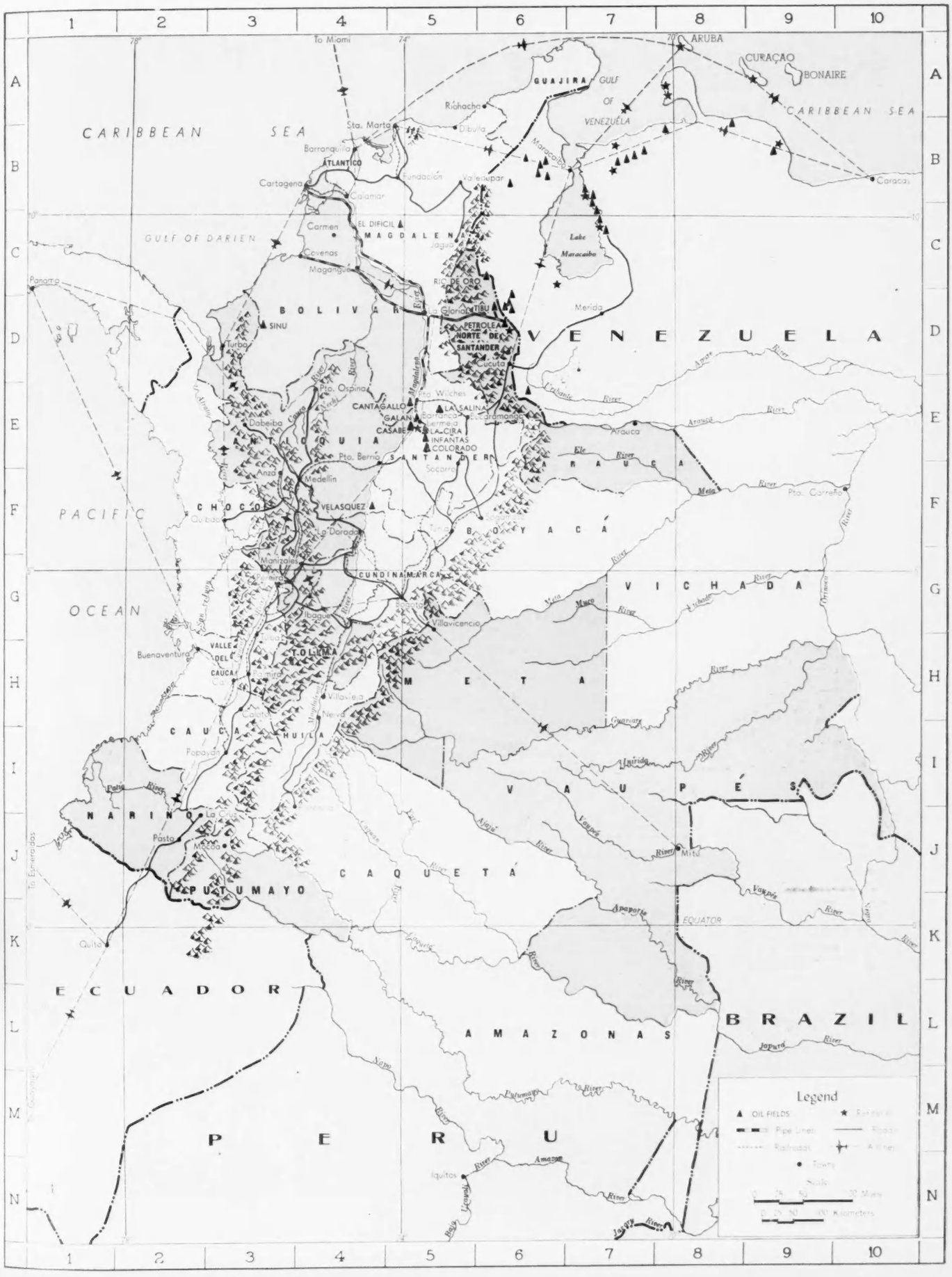
● **FIELD TESTING:** Products that pass exacting laboratory tests are then field-tested under the direction of Mission field engineers. The results are compared with those found in Mission's many recorded tests of Mission and competitive products. At this stage, the practical advice of oil company engineers and field men contributes greatly to the perfecting of the new products.

Thus Mission leadership is maintained throughout the world.

COLOMBIA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Caracas
Lake Maracaibo
Merida
VENEZUELA
EL DIFICIL
MAGDALENA
Carmen
Covenas
Magangué
Panama
BOLIVAR
SINU
Turbo
RIO DE ORO
La Gloria
TIBU
PETROLEA
NORTE DE SANTANDER
Cucuta
Pto. Ospina
CANTAGALLO
GALAN
CASABE
LA CIRA
INFANTAS
COLORADO
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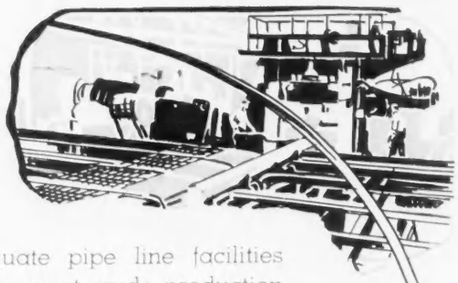
Youngstown to WEST TEXAS



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COLOMBIA

DESPITE the unprecedented world demand for crude petroleum and products, Colombia failed to increase her oil production although early postwar prospects had indicated there would be a gain. Actually the country has shown a slight increase in productive potential over the past five or six years, but was forced into a reduction instead of an increase over 1945 through labor difficulties which tied up the producing areas for about a month late in the year. The 1946 production of 22,061,914 barrels fell nearly three quarters of a million short of 1945, but it is estimated that more than a million barrels of production was lost on account of the strike.

Recent years have definitely shown the two principal fields of the De Mares concession to be declining in production faster than the pace set by current drilling programs. Although it is still the largest producer in the country, La Cira field has declined from about 14.5 million barrels in 1944 to a little more than 9.6 million barrels in 1946, but the curve is expected to show more pronounced flattening from now on. During the same period there has been very little decline in the slightly more than 3 million barrel annual output from Infantas.

Declines in De Mares have been offset somewhat by the rising potential of two relatively new fields, Casabe and Tibu, but other discoveries of recent years have been unimportant from the standpoint of additional reserves.

Casabe field was placed on commercial production in the middle of 1945, at which time it was producing some 8000 barrels daily. This potential has been built up to 11,652 barrels daily by the end of 1946, and productive area had been expanded to the point where it can support an active drilling campaign.

Tibu field, on the Barco concession, started its first important production in 1944, when it produced 705,330 barrels. During 1946 its output increased to 2,893,105 barrels, and has already outstripped Petrolea, the first important field on the Barco. Of particular importance at Tibu is the present program of attempting to define the producing potentialities of the Cretaceous limestone production. Only two of the deep Cretaceous wells are producing, but it is hoped that reserve in the Cretaceous may be greater than the Tertiary, the principal producing section.

Drilling Activity

Colombia is showing a decided increase in drilling activity as compared with recent years. The 120 wells completed during 1946 represents the greatest volume of drilling activity since 1939 when there were 157 wells drilled.

The significant feature of current drilling is the increase in the amount of exploratory drilling, as well as the trend toward deeper drilling. The active operators are making every effort to make a complete test of the sedimentary section in each wildcat, so that the current operations are much more valuable as a source for subsurface information. Several wildcats completed during 1946 were taken all the way down to basement rocks.

Of the 17 wildcats completed during the year, two were productive, and the remaining 15 were dry, although showings were reported in several of them. The Texas Petroleum Company's discovery on the Teran-Guaguaqui property in the Upper Magdalena Valley is perhaps the more important of

Colombia Production and Completion Data

YEAR	PRODUCTION Annual	Daily Average	Prod.	Dry	Total
1940	25,564,655	69,849	98	10	108
1941	24,645,347	67,521	41	11	52
1942	10,619,678	29,065	16	17	33
1943	13,463,558	36,886	13	6	19
1944	22,770,142	62,214	23	10	33
1945	22,802,182	62,472	49	10	59
1946	22,061,914	60,443	92	28	120

Drilling in Colombia

STATE AND AREA	WELLS COMPLETED IN 1946 Oil	Gas	Dry	Total Wells	Total Footage	Field Wells Drilling and Shut Down at End of 1946 Dr	SD	Total
Antioquia:								
Casabe	17			17	68,108	2		2
Santander:								
Cantagallo	1	1	1	3	16,626	2		2
Infantas	2		1	3	5,110			
Galan	3			3	12,760			
La Cira	43		3	46	124,880	4		4
Colorado	5			5	21,075	2		2
La Salina	1			1	4,378	1		1
Wildcats			1	1	9,310			
Magdalena:								
El Dificil	3		1	4	22,753	2		2
Wildcats			5	5	41,192			
Norte de Santander:								
Tibu	12		1	13	74,441	5	1	6
Bolivar:								
Sinu	1		2	7	11,918	1	1	2
Wildcats			6	2	9,175			
Boyaca:								
Wildcats (Velasquez)	1			1	8,455	1		1
Meta:								
Wildcats			4	4	13,889			
Caldas:								
Wildcats			3	3	10,674			
Total Colombia	89	1	28	118	454,744	20	2	22

Oil Wells and Crude Oil Production of Colombia

CONCESSION, STATE AND FIELD	Operating Company	Year of Discovery	OIL WELLS AT END OF 1946 Shut In	Producing Flowing	Art. Lift	Total Producing	CRUDE OIL PRODUCTION Barrels Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
Yondo Concession (Antioquia):										
Casabe	Shell Group	1941		28	23	51	11,652	1,622,550	3,208,640	4,973,410
De Mares Concession (Santander):										
Infantas	Tropical Oil Company	1918		4	287	291	8,587	3,223,851	2,957,413	144,614,659
La Cira	Tropical Oil Company	1926		20	603	623	27,345	12,382,978	9,671,679	212,721,619
Colorado	Tropical Oil Company	1928		5	2	7	311	3,820	63,300	69,020
Galan	Tropical Oil Company	1945	2	2		2	39	28,762	31,645	60,407
Barco Concession (Norte de Santander):										
Petrolea	Colombian Petroleum Company	1933	33	48	8	56	9,549	3,860,589	3,236,123	23,710,482
Tibu	Colombian Petroleum Company	1940		32	6	38	11,220	1,679,632	2,893,105	5,365,330
Cantagallo Concession (Santander):										
Cantagallo	Sceeny-Vacuum	1943	3				Not Producing			
El Dificil Concession (Magdalena):										
El Dificil	Shell Group	1943	11				Not Producing			
Total Colombia			49	139	929	1068	68,693	22,802,182	22,061,914	391,514,927

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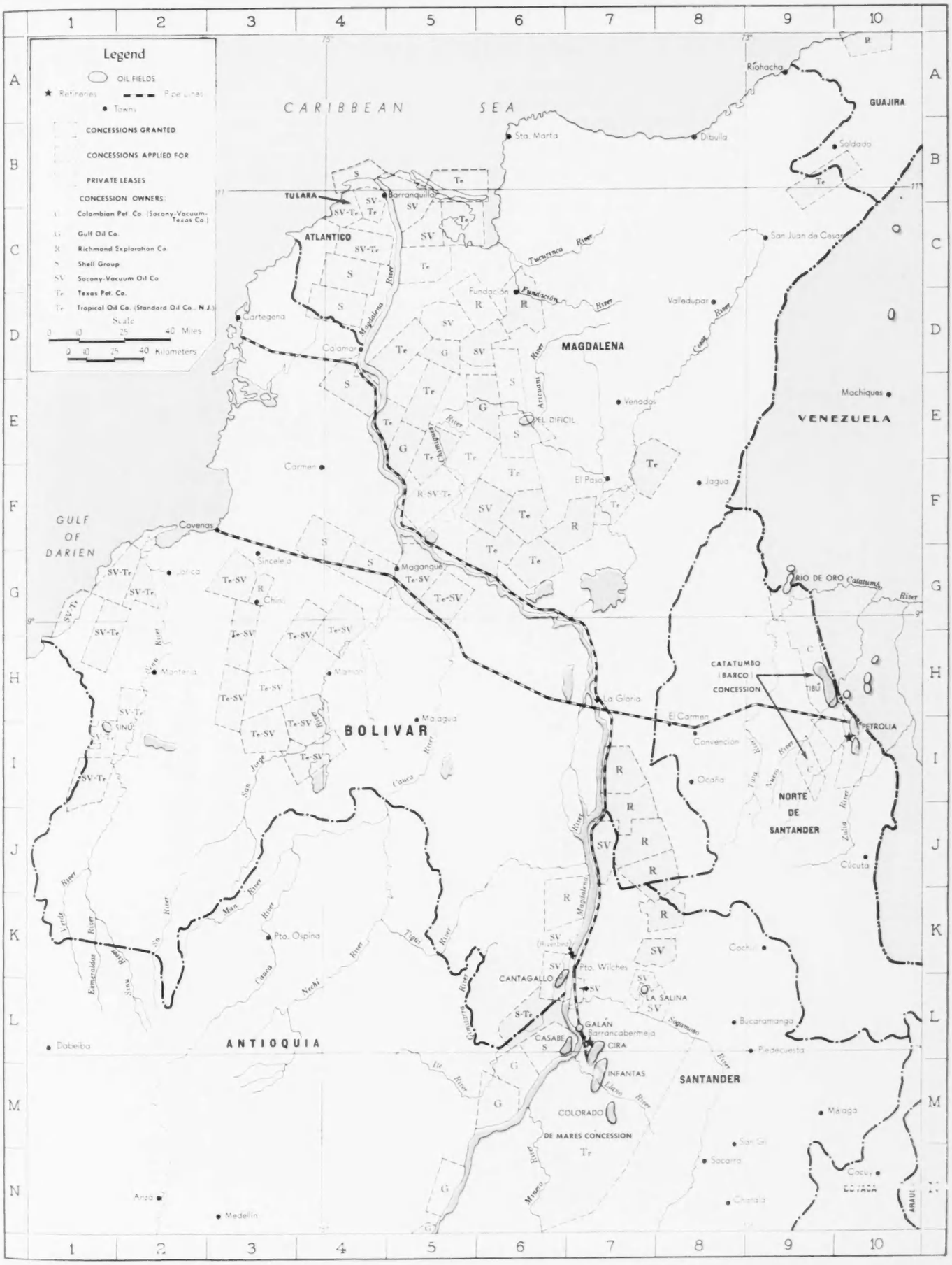
COLOMBIA — Northern Fields and Concessions



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the two successful wildcats, producing more than 400 barrels daily on initial test through a small choke from Tertiary formations. A considerable oil-bearing section was found, but further development is needed to give a better idea of its possible importance. The other productive well, drilled by Socony-Vacuum Oil Company of Colombia in the Las Monas area of the Middle Valley, is a small producer from shallow, badly broken formations and from present indications is of relatively minor significance.

Nearly half of the rigs in operation at the close of the year were engaged in wildcat drilling, and whereas a year ago exploratory drilling was confined almost entirely to the Magdalena Valley and to the small area in the lower part of the Llanos where Shell was operating, the search for new oil has expanded to nearly all portions of the northern half of Colombia. Tropical Oil Company has entered the Llanos with a heavy rig. The Texas Petroleum Company is moving into the Caqueta area in southern Colombia, and Tropical and Socony are drilling a wildcat near Barranquilla on the northern coast which seems likely to produce. Additional interest is being shown in the area west of the Magdalena River in the Department of Bolivar.

In only two localities are there possibilities of any great volume of development drilling. Casabe field needs something like 300 to 350 wells to complete development of the known productive area, and Tibu field on the Barco is keeping six rigs busy on Tertiary and Cretaceous development. La Cira and Infantas, on the De Mares concession where most of the country's wells have been drilled in the past, are now about in the stripper class, and will not account for a great deal of additional drilling. It is unlikely that 1947 drilling will exceed very much the 1946 record.

Concessions

One of the greatest needs in Colombia for promotion of development of new petroleum resources appears to be a workable system whereby concessions may be obtained for immediate exploration without too great a time lapse. Six foreign companies have entered the country, acquired acreage, and drilled wells. In all they hold only 6,313,002 acres validated for the actual drilling of wells, of which only 1,884,152 acres are in the exploitation, or producing stage.

These companies have shown their interest by filing applications covering millions of acres, but of nearly 500 applications filed, no more than half have been accepted, and there remains 19,156,710 acres in that accepted classification upon which action has not yet been taken toward granting of exploration privileges. The accepted applications indicate a great interest in the Llanos region where nearly 10 million acres await final approval in addition to 1.75 million acres already granted.

Tropical Oil Company, the oldest single operator in the country, is the largest single holder of concession acreage of all classifications with 10,187,215 acres in all classifiications. With the exception of the 1,265,152-acre De Mares concession, all of it has been recently acquired.

New Law Indicated

Recent activity on the part of the governmental authorities indicate that they are casting about for some means of encouraging greater explortory activity so that new areas might be found and developed to boost the country's output and protect its position in the world market. It is felt that this will have to be done before the impact of crude in quantity from other producing countries, principally the Middle East

Wildcats Completed in Colombia in 1946

STATE	Company and Well	Date Completed	Total Depth (Feet)	Results
Magdalena	Shell Group's San Angel 5	1-22	3245	Abandoned
Meta	Shell Group's Chafurray 3	2-28	2560	Abandoned
Meta	Shell Group's San Martin 2	5-21	6818	Aband. shows of heavy, 14-grav. oil not commercial
Magdalena	Shell Group's San Angel 4	5-14	6687	Abandoned
Meta	Shell Group's Chafurray 4	5-22	2321	Abandoned. Slight tar sand shows
Caldas	Richmond Exploration Company's Gutierrez 1	6-4-46	1659	Abandoned
Bolivar	Socony-Vacuum's Yanacue 1	7-30	5210	Abandoned. Shows of heavy, black oil. Upper Tertiary
Meta	Shell Group's Chafurray 5	9-4	2190	Abandoned
Caldas	Richmond's Chorrea-Manteca 4	9-21	6980	Abandoned
Caldas	Richmond's Gutierrez 2	9-29	2125	Abandoned
Santander	Socony-Vacuum's Pedral 1	10-2	9310	Abandoned
Bolivar	Socony-Vacuum's Yanacue 2	10-7	3965	Abandoned
Magdalena	Richmond's Caraballo 1	11-14	11806	Abandoned
Magdalena	Petrolees Ariguani (Tropical Oil half-int.) Costa Rica 1	11-24	10609	Abandoned. Showing 6900-9000 feet, not commercial
Boyaca	Texas Pet. Co.'s Velasquez 1	11-29	8455	Discovery. Perforated 6900-7100 feet, flow 411 barrels 27.2-gravity oil day, ¼-inch choke, from sand in upper Tertiary
Santander	Socony-Vacuum's La Salina 1, Las Monas Concession	10-14	4378	Perforated 1770-2230 feet Eocene sand. Production 75 barrels 21-gravity oil day. Open tubing
Magdalena	Shell Group's San Angel 3	1-13	8845	Abandoned

Engineering and Geological Data on Colombia Oil Fields

CONCESSION, STATE AND FIELD	Proved Area (Acres)	Gravity of Oil	PRODUCING FORMATION			Depth of Wells (Ft.)		Type Structure
			Name	Kind	Age	Minimum to Top of Pay	Maximum Total Depth of Wells/Ft.)	
De Mares Concession (Santander):								
Infantas	5,300	24.5	Zones A, B, C	Sand	Olig-Eo.	300	2600	Faulted Anticline
La Cira	4,700	24.5	Zones A, B, C	Sand	Olig-Eo.	200	4300	Faulted Anticline
Colorado	800	25	Colorado	Sand	Eocene	3400	4200	Faulted Anticline
Barco Concession (Norte de Santander):								
Petrolea	4,000	46	La Luna, Ostea, Zones 1, 2, 3, 4	Limestone	Cretaceous	99	1953	Anticline
Rio de Oro	400	38	Catatumbo, Rio de Oro, Uribante	Shale, Sand, Limestone	Cretaceous	....	1865	Faulted Anticline
Carbonera		21	Cuerros, Barco	Sand	Eocene	....	3359	Faulted Anticline
Tibu	8,000	33	Barco, Catatumbo, Uribante	Shale, Sand, Limestone	Cretaceous	4300	10876	Anticline
Yondo Concession (Antioquia):								
Casabe	5,000	21	La Cira, Colorado	Sand	L. Mio-Olig.	2100	3772	Faulted Anticline
Cantagallo Concession (Bolivar):								
Cantagallo	550	20	Esmeraldas, La Paz	Sand	Olig-Eo.	....	6170	Faulted Anticline
El Dificil Concession (Magdalena):								
El Dificil	2,500	40	El Dificil	Limestone	Oligocene	5500	6100	Faulted Anticline
Floresanto Concession (Bolivar):								
Sinu	250	51	Pajuil	Sand	Miocene	560	2300	Faulted Anticline
Las Monas Concession (Santander):								
La Salina	400	21	Lisama	Sand	Eocene	1770	4378	Faulted Anticline
Teran-Guaguaqui Concession (Boyaca):								
Velasquez	400	27.2		Sand	Tertiary	6700	8455	Anticline

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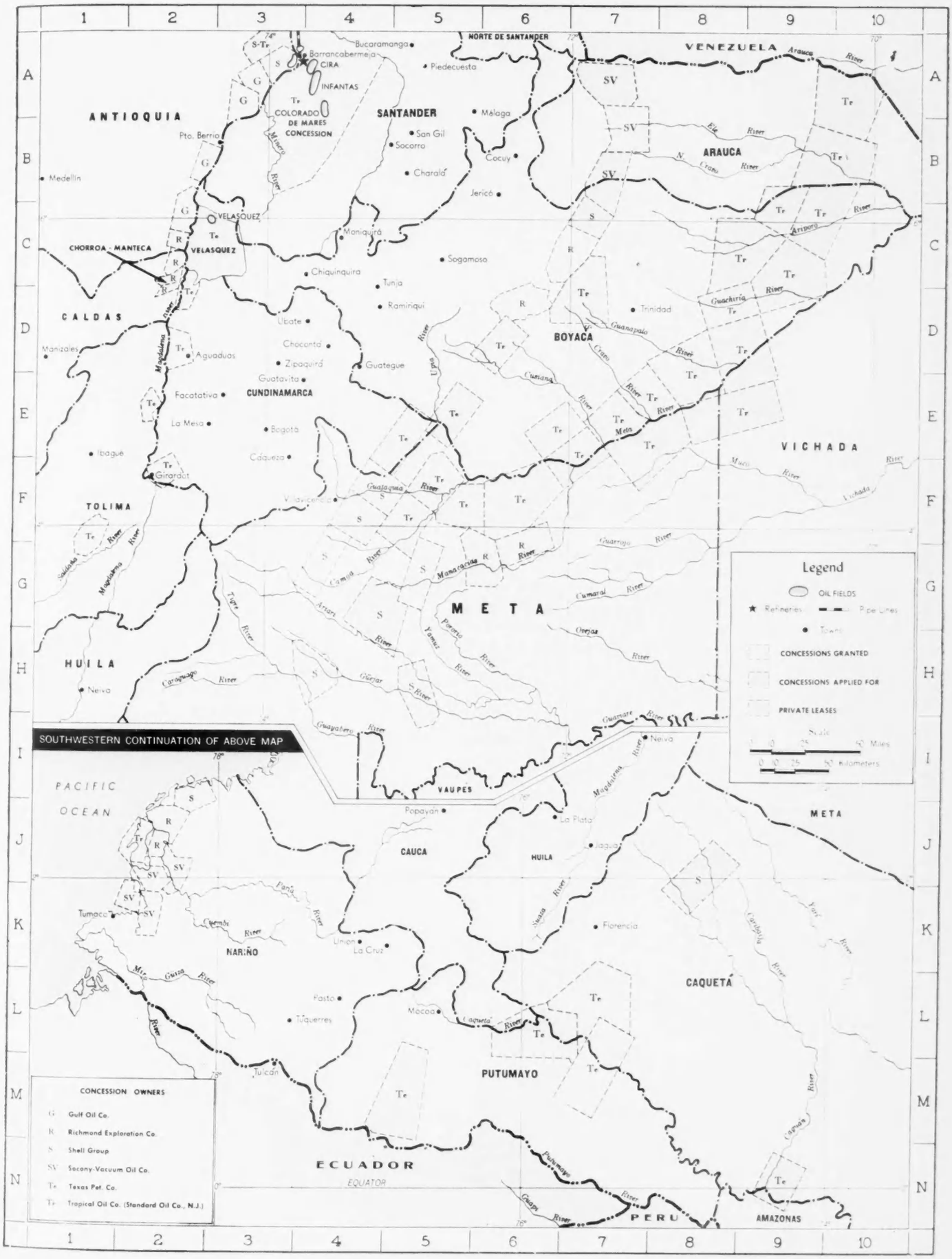
COLOMBIA — Southern Fields and Concessions



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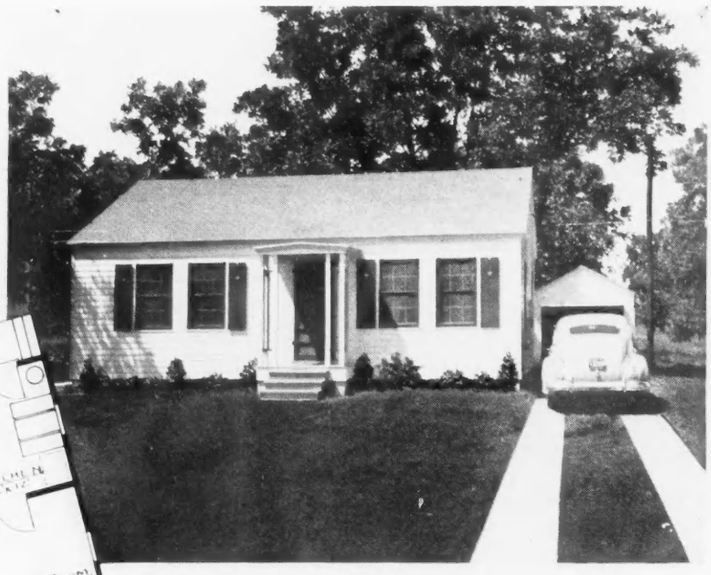

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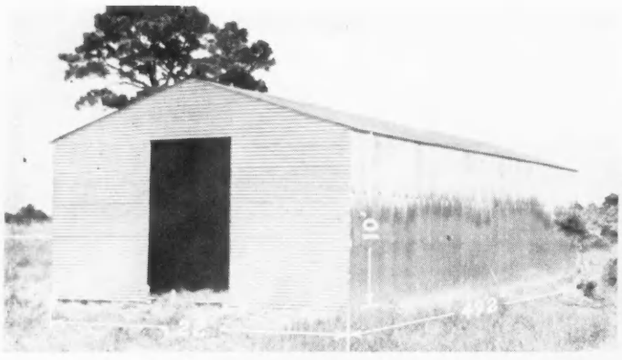

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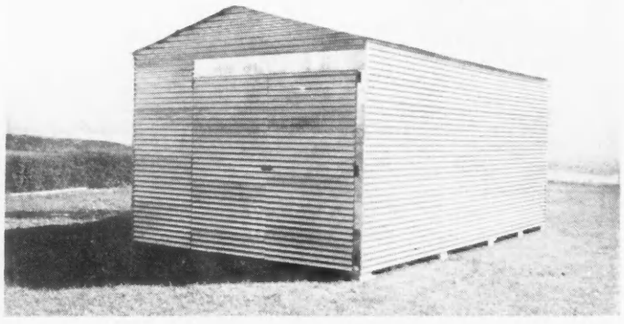

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COLOMBIA

Outstanding retarding factors, in the opinion of many, have been delays in granting of concessions. A workable method is needed of speeding up the processes whereby a company may file on, and be granted, acreage on which wildcats may be drilled. The problem of private titles obtains whether the operator is trying to obtain a government concession as a national reserve, or a lease from the owner believed to have title to the minerals prior to the effective date of the nationalization of minerals in 1873.

Intensely democratic in its ideals, the government hesitates to put into effect some method whereby the rights of private titleholders might be jeopardized. Pending the solution of this problem, there is also the expectation that a new oil law will be passed to supplant the 1931 statutes. This new law likely will call for provisions to increase royalty and bonus payments. New concessions granted recently have carried riders calling for increases which might later be written into the law. Operators have been hesitant about signing such an agreement, although many have done so in order to have property for their exploration programs.

Word from Bogota indicates that it is thought the new law will be passed this year, although it is not known exactly what changes will be incorporated. But the terms of riders are indicative of just what direction some provisions will take. It is likely that surface fees during the exploratory period will be about doubled to approximately 10 cents an acre per year, this plus a payment during the 30-year exploitation period of about 60 cents a year. In addition a bonus in the form of a lump sum amounting to about 50 cents an acre must be paid 25 percent down and the remainder when commercial oil is found.

Meanwhile the outlook for continued exploration is good, although the acreage situation tones it down some. The Tri-Pet organization owned by Sinclair, Cities Service, and Richfield which will operate in Colombia as Companias Unidas de Petroleo (United Oil Companies) is moving in equipment for a wildcat test on private land leases in the northeastern part of the country south of Covenas. A heavy-duty rig was moved in from the United States and came in through the port at Cartagena. Superior Oil Company has recently established an office in Bogota.

An increase in exploration likely will increase Colombia's output, since the results of exploratory drilling has been encouraging. A remarkable percentage of the wildcats drilled have shown evidence of oil, although much of it has been non-commercial. Pipe line transportation poses a problem.

Andean National Corporation, Tropical Oil Company's carrier, is the only pipe line serving the Magdalena Valley area. This 334-mile line is running at near capacity of 55,000 barrels daily and has already been fully looped so that now it operates as two 10-inch systems. It has prospects of being called upon to move production from The Texas Company's Velasquez field, Socony-Vacuum's Cantagallo, and Socony's La Salina areas. To do this it should extend its lines and increase capacity. It has indicated that, as a common carrier, it will be willing to do so should sufficient production become available.

Petroleum Concessions in Colombia

(Area in Acres. Data as of End of 1946)

	COMPANIES											
DEPARTMENT OR INTENDENCIA	Colombian Pet. Co.	Gulf Oil Corp.	Richmond Pet. Co.	Richmond-Socony-Texas	Shell Group	Socony-Vacuum Oil Co.	Socony-Shell	Socony-Texas	Socony-Tropical	Texas Pet. Co.	Tropical Oil Co.	Total
Concessions in Exploitation:												
Antioquia					118,139							118,139
Norte de Santander	461,596											461,596
Santander											1,265,152	1,265,152
Total in Exploitation	461,596				118,139						1,265,152	1,884,152
Concessions in Exploration:												
Antioquia		456,090										456,090
Antioquia and Bolivar						52,360			62,679			115,039
Antioquia and Caldas			60,965									60,965
Arauca						244,955						244,955
Bolivar			105,188					123,503	123,337			352,028
Caldas			22,726									22,726
Caqueta and Putamayo										494,195		494,195
Cundinamarca										86,660		86,660
Magdalena			107,489	123,550	242,524	117,973				123,407	298,472	1,014,415
Meta					985,445						494,190	1,479,635
Norte de Santander												
Santander						102,144						102,144
Total in Exploration		456,090	296,368	123,550	1,228,969	517,432		123,503	186,016	704,262	792,662	4,428,852
Concession Applications Accepted:*												
Antioquia and Bolviar							123,303					123,303
Arauca						491,200					984,590	1,475,790
Atlantica					169,669				177,433			347,102
Atlantico-Bolivar					121,931							121,931
Bolivar			32,274		306,516	13,343		1,358,766	565,282			2,276,181
Boyaca			439,962		150,343					247,008	3,458,598	4,295,911
Boyaca-Vichada											1,464,105	1,464,105
Caqueta					370,341					493,805		864,146
Caqueta-Amazonas										247,098		247,098
Cundinamarca											240,821	240,821
Cundinamarca-Boyaca-Meta					234,678					247,100		481,778
Guajira			116,777									116,777
Magdalena		268,553	738,478			569,224				660,952	520,813	2,507,020
Magdalena-Guajira											123,535	123,535
Meta			444,770		604,286						1,228,290	2,277,346
Narino			123,155			454,328					108,739	686,222
Norte de Santander			93,443									93,443
Putamayo										985,042		985,042
Santander						243,987						243,987
Tolima										185,172		185,172
Total in Applications		268,553	1,988,859		2,017,764	1,572,082	123,303	1,358,766	682,715	3,015,267	8,129,401	19,156,710
Grand Total	461,596	724,643	2,285,227	123,550	3,364,872	2,089,514	123,303	1,482,269	868,721	3,719,529	10,187,215	25,430,449

* Applications on these concessions have been accepted by Colombian government, but actual granting of full concession rights still pending.

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ALTHOUGH drilling showed some increase in 1946, Ecuador's crude oil production last year continued to decline and totaled 2,366,539 barrels as compared with 2,663,726 barrels the previous year. Daily output from all fields at the end of the year was estimated at 4675 barrels.

The principal producer in Ecuador is the Anglo-Ecuadorian Oilfields, Ltd., a British company, which operates Ancon field in Guayas Province on the Santa Elena peninsula. This field, opened in 1921, now has about 575 producing wells and during 1946 the production was estimated at 1,676,800 barrels.

International's Program

Almost all of the wildcat drilling in Ecuador during 1946 was conducted by International Ecuadorean Petroleum Company, the South American subsidiary of Canada's International Petroleum Company, Ltd. In all, IEPC completed six wildcat tests during 1946 and at the end of the year had one rig operating. Reports from Guayaquil say that IEPC's exploration venture in Ecuador has been terminated and the company is now in liquidation. IEPC's only production in Ecuador is from five wells in the El Tambo field, Guayas Province. At the end of 1946, these wells were producing a total of 2½ barrels daily and during the year the output was 939 barrels as compared with 832 barrels in 1945. Cumulative production through 1946 was 14,040 barrels.

One of IEPC's wildcat failures was its Bajada 1, located 32 miles southwest of Guayaquil in Guayas Province. Total depth was 13,206 feet and at the time it was abandoned (February, 1946) it was the deepest test drilled in Latin America. However, since then a deeper test has been completed in Venezuela.

At the end of the year, IEPC's Tosagua 1, 18 miles south of Bahia de Caraquez, was drilling below 4300 feet. In all, IEPC has completed 19 unsuccessful wildcat tests in Ecuador since 1940.

Six miles southeast of the Ancon field, Anglo-Ecuadorian Oilfields, Ltd., was testing its Certeza 700 at the end of the year at a total depth of 3486 feet. The first test in the Atlanta formation (Eocene) showed water but it probably will make a producer in Eocene beds above the Atlanta sands, reports indicate.

Meanwhile, Anglo-Ecuadorean and Ecuador Oilfields, Ltd., the latter being operator in El Tigre and Cautivo fields, are doing gravity meter work on Santa Elena peninsula and adjacent areas. Late in 1946 the two companies started a magnetometer survey. Anglo-Ecuadorian also is making a geochemical survey of the Cia. Petrolera del Ecuador's "El Oro" concession.

Both companies continued development work and step-out drilling in their Santa Elena fields, but the output of the fields continued to decline.

Anglo-Saxon Petroleum Company (Shell Group) holds a 25-million-acre concession in eastern Ecuador and has two geophysical parties working. This Oriente concession in late 1945 saw the company complete its Vauno 1, northeast of Arajuno, as a dry hole at a total depth of 5281 feet. The test bottomed in the Hollin formation of the Lower Cretaceous Age. Production attempts made in the Hollin and overlying Napo formation of the Middle Cretaceous Age are reported to have found no oil.

IEPC has withdrawn all geological and geophysical parties from the coastal area, but has two geological praties of the Andes.

Concessions in Ecuador, which total about 30 million acres,

Wildcats Completed in Ecuador in 1946

Province	Company and Well	Date Completed	Total Depth (Feet)	Results
Guayas	International Ecuadorean's Bajada 1	2-46	13,206	Dry
Guayas	International Ecuadorean's Rodeo 2	3-46	10,485	Dry in Eocene
Manabi	International Ecuadorean's Manta 3	3-46	5,496	Dry in Cretaceous
Manabi	International Ecuadorean's Telembi 1	9-46	4,613	Dry
Manabi	International Ecuadorean's Bordon 1	9-46	10,452	Dry
Guayas	International Ecuadorean's Rodeo 3	10-46	7,397	Dry in Eocene
Guayas	International Ecuadorean's Tosagua 1		4,300	Drilling at end of yr.
Guayas	Anglo-Ecuadorean's Certeza 700		3,486	Testing in Eocene

Producing Wells and Oil Production of Ecuador

Province and Field	Operating Company	Year of Discovery	OIL WELLS AT END OF 1945				CRUDE OIL PRODUCTION (Barrels)			
			Producing							
			Shut In	Flowing	Art. Lift	Total Producing	Daily at End of 1946	Year 1945	Year 1946[1]	Cumulative Through 1946 (Est.)
Guayas:										
Ancon	Anglo-Ecuadorean Oilfields, Ltd.	1921	45	40	530	570	4,595	1,966,358	1,676,800	33,355,953
El Tambo	International Ecuadorean Pet. Co.	1931			5	5	2½	832	939	14,040
Carolina-Sta. Paula	Carolina Oil Company		45		28	28	180	56,292	66,200	948,364
Petropolis	Petropolis Oil Company	1937	1	2	4	6	210	102,072	78,300	611,462
Concepcion	Concepcion Ecuadorean Oilfields, Ltd.	1931	1	4	12	16	200	103,286	76,600	656,392
El Tigre	Ecuador Oilfields, Ltd.	1938		13	2	15	1,280	434,886	467,700	3,327,149
El Cautivo	Ecuador Oilfields, Ltd.	1920			39	39				
Totals			92	59	620	679	6,467½	2,663,726	2,366,539	39,013,360

[1] Based on 11 months production.

Engineering and Geological Data on Ecuador Oil Fields

FIELD AND PROVINCE	Proved Area (Acres)	Gravity of Oil (API)	PRODUCING FORMATION						Type Structure
			Name	Kind	Age	Depth of Wells (Ft.) Minimum to Top of Pay	Depth of Wells (Ft.) Maximum Total Depth of Wells	Avg. Thickness of Pay (Ft.)	
Ancon-Sta. Elena, Guayas		37-41	Socorro	Sandtsone	Eocene	1200	1800	600	Faulted anticline
			Atlanta			3000	6000	2500	
El Cautivo, Guayas		39-44	Socorro	Sand	Eocene	750	1000	250	Steeply dipping erratic blocks
Carolina, Sta. Paula, Guayas		28-31	Socorro	Sand	Eocene	632	836	200	Steeply dipping erratic blocks
Concepcion, Guayas		38	Atlanta	Sand	Eocene		3293		Structural strat. trap
El Tambo, Guayas			Socorro	Sand	Eocene		4000		Structural strat. trap
El Tigre, Guayas	200	39	Atlanta	Sand	Eocene	2900	4300	400	Structural strat. trap
Petropolis, Guayas	100	35		Shattered Chert	Eocene		2000		Steeply dipping erratic blocks

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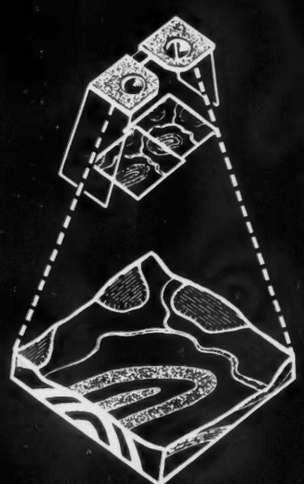

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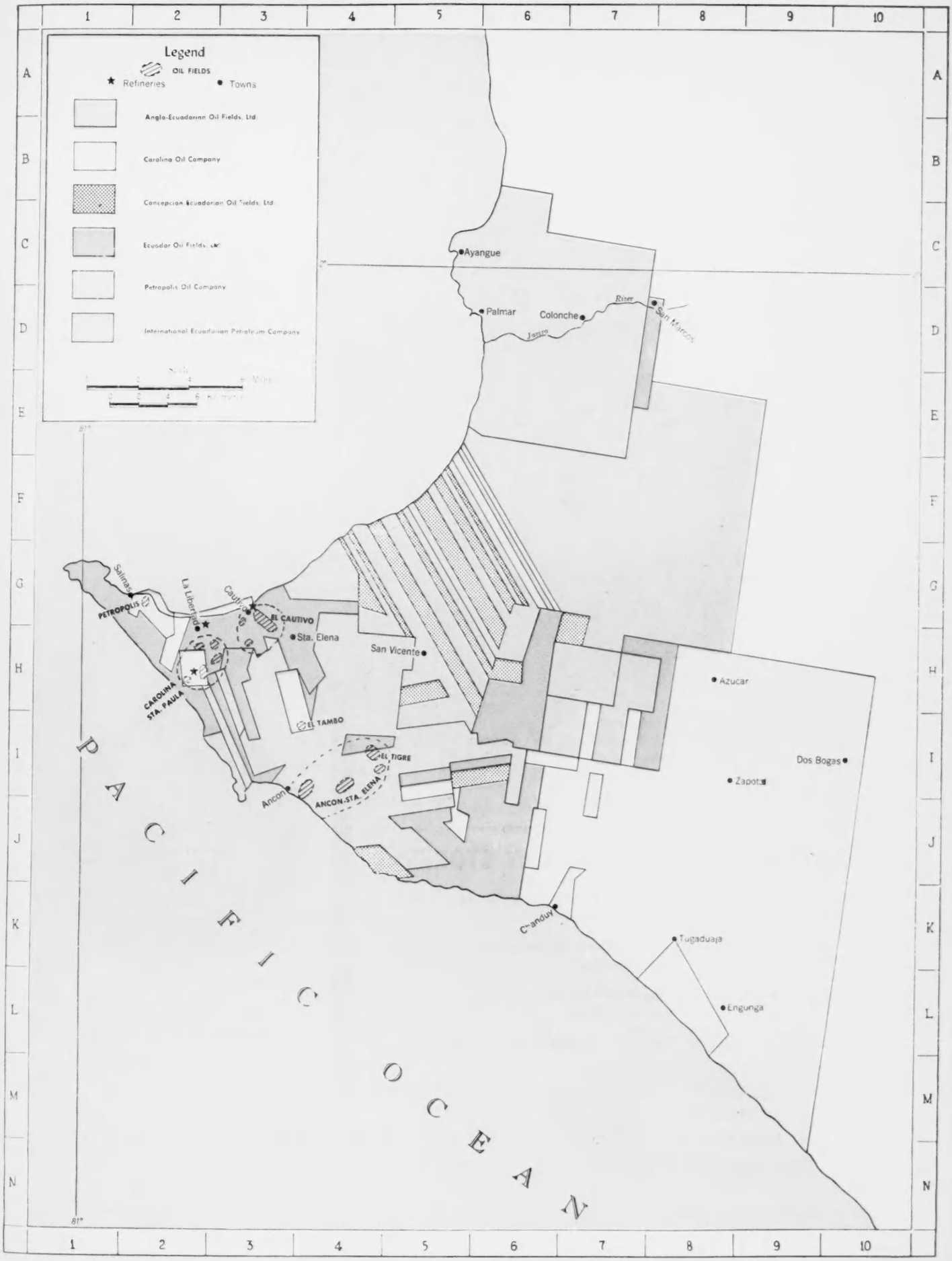
ECUADOR — Santa Elena Fields and Concessions



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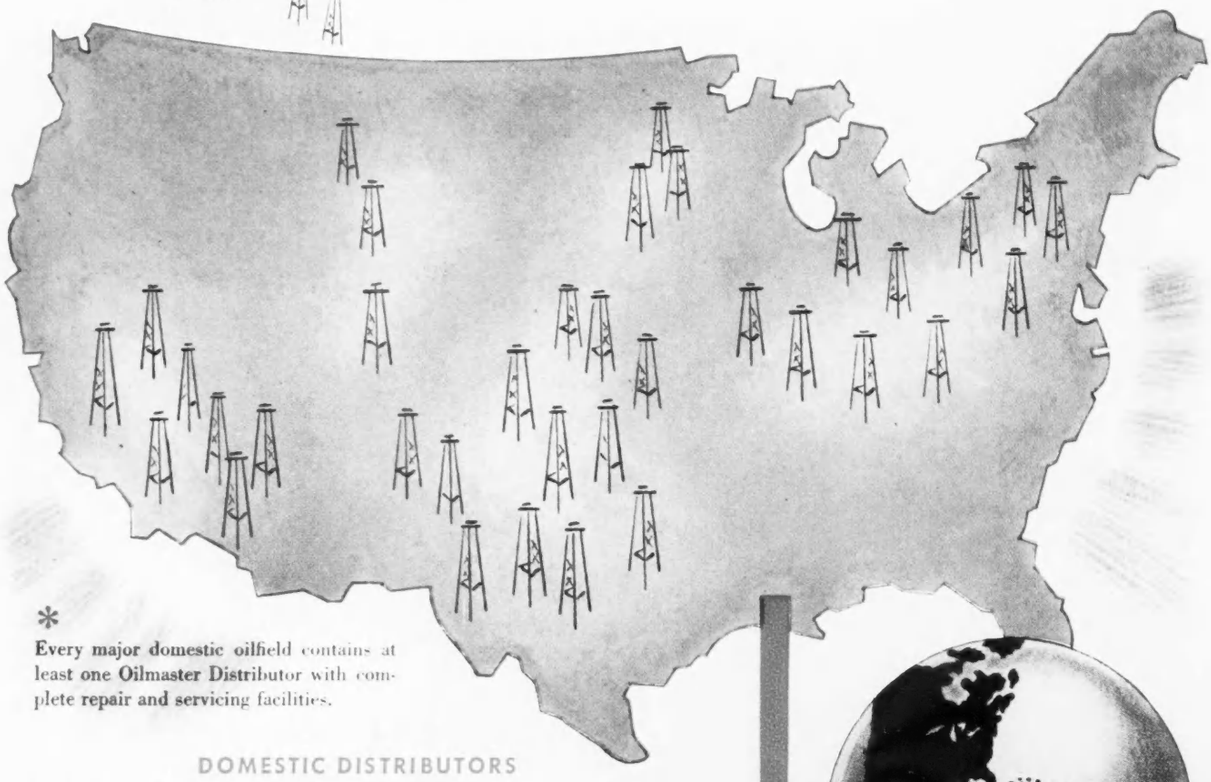

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ECUADOR—Continued

are held by eight companies with oil being produced on concessions operated by six of the companies. Anglo-Saxon's concession of about 24½ million acres in the Oriente is the largest of the group. The next largest acreage holder is IEPC with about 4½ million acres located along the coast from Isla Puna, Bay of Guayaquil, near the Peruvian border on the south, to the Colombian border on the north. Anglo-Ecuadorian's concessions total about 95,000 acres. Other concession holders and their acreage are Ecuador Oilfields, Ltd., 44,500 acres; Carolina Oil Company, 2225 acres; Concepcion Ecuadorian Oilfields, Ltd., 16,000 acres; Petropolis Oil Company, 3000 acres; and Compania Petrolera del Ecuador, 357,183 acres.

Refineries of Ecuador

Company Headquarters Address	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
Anglo-Ecuadorian Oilfields, Ltd., 146 Dashwood House, Old Broad St., E.C., 2, London	La Liberdad, (100 mi. w Guayaquil)	2700	None	Skimming (One lb. oil cut)	Operating
Ecuador Oilfields, Ltd., River Plate House, Finsbury Circus, E. C. 2, London; Apto. 865, Guayaquil, Ecuador	Cautivo (Guayas, 90 mi. from Guayaquil	600	None	Skimming	Operating
Carolina Oil Company, P. O. Box 1035, Guayaquil	Carolina			Skimming	Shutdown

Crude Oil Pipe Lines of Ecuador

COMPANY	Origin	Terminus	Length Miles	Diameter (In.)	No. of Pump Stations	Capacity of Line (Bbls. Daily)	Year Completed	Status
Petropolis Oil Co.	Petropolis Salinas	Libertad	8	4	1	3600	1940	Operating
Carolina Oil Co.	Santa Paula	Carolina	3	4	2	2400		Operating
Ecuador Oilfields, Ltd. (British Controlled Oilfields, Ltd.)	Tigre	Cautivo	11	4	1	2500	1940	Operating
Ecuador Oilfields, Ltd	Cautivo	Anglo tank-farm and submarine line	2	8 plus 10	None	30,000	1940	Operating
Ecuador Oilfields, Ltd	Cautivo	Anglo tank-farm and submarine line	2	10				Planned
Anglo-Ecuadorian Oilfields, Ltd	Ancon	La Libertad	8	6	1	12,960	1925	Operating

PARAGUAY

UNION Oil Company of California's first wildcat drilling venture in Paraguay—the Santa Rosa 1—was abandoned in January, 1947, at a total depth of 7579 feet. The test was located in the Chaco of Paraguay about 255 miles west of Puerto Casado, a point on the Paraguay River at which equipment is landed on its way from Montevedio or Buenos Aires. From Puerto Casado, equipment is transported to the well-site by rail and truck.

Following abandonment of Santa Rosa 1, location for a second test was staked about 50 miles east. Equipment is being moved in for this test and drilling will get under way immediately.

Little information is available on the age and nature of formations penetrated in the first well. However, tentative correlations at the present time place the bottom of the hole in formations of Lower Devonian Age.

One of the most serious problems encountered in the Chaco area is the establishment of a fresh water supply. Water wells generally are drilled to a depth of approximately 120 feet, but majority of the wells yield a brackish water, which, while satisfactory for drilling purposes, is unsuited for human use. One or two wells drilled near the present camp at Santa Rosa yielded fresh water in quantities sufficient for camp use. Reservoirs constructed to catch rain water also augmented the fresh water supply.

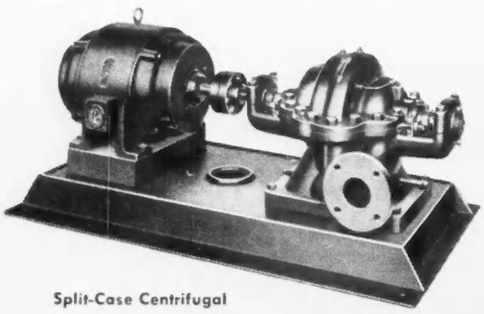
Whether the entire camp at Santa Rosa will be moved nearer the site of the second location has not been determined, the problem of providing fresh water supplies having much to do with final decision. So important is the problem of locating fresh water wells, that a company geologist has been assigned the sole task of working out the local water table and determining the most favorable sites for drilling water wells.

In making the whole of the Chaco Territory a national oil reservation, the Paraguayan government also authorized the Ministry of Public Works and Communications to contract Union Oil Company of California for prospecting, investigating and exploiting for oil. Unlike most other deals between oil companies and South American nations, the agreement between Union and the Paraguayan government is a contract and not a concession. As the contractor for the government, Union supplies the geological and geophysical crews and equipment required for surveying the areas; will drill wildcat tests and develop oil fields if there are any discovered; and will provide the necessary oil experience in drilling, transportation, refining and marketing.

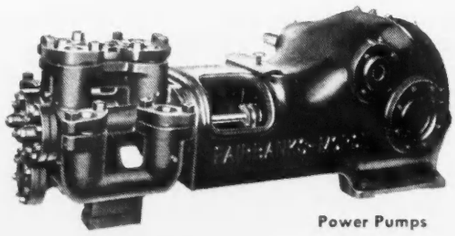
The original document signed by Union and the government actually forms the basis for future specific and complete contracts. The over-all agreement grants the company exploratory privilege for the entire Chaco for a period of 10 years. Union has the right to select exploratory blocks "pertenencias" with no limit to the number selected. These can be held for a period of four years with no provision for extension. In case oil is discovered an exploitation block can be selected around the discovery well. One or more blocks of 2000 hectares (4942 acres) each can be selected on the same structure. These blocks can be held for a period of 35 years with the privilege of a 15-year extension but in no case longer than 60 years from the date of the signing of the original decree.

The contract grants the oil company a minimum of 85 percent of the oil produced with all expenses being paid by the company. A method of establishing the price of oil also is provided in the contract. In the event oil is discovered, Union has the right to construct refineries, lay pipe lines and make other installations.

According to a government decree dated February 13, 1947, Union will form a Paraguayan subsidiary company in connection with its operations.



Split-Case Centrifugal



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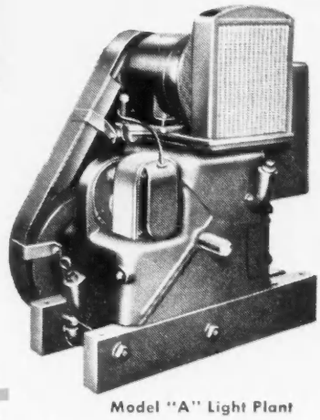
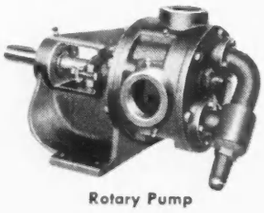
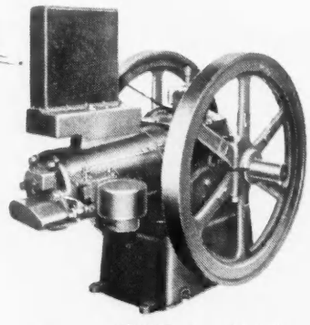


Model "A" Light Plant



Rotary Pump



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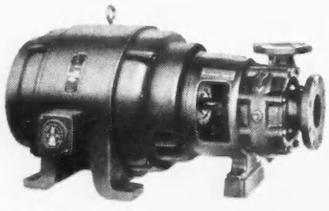
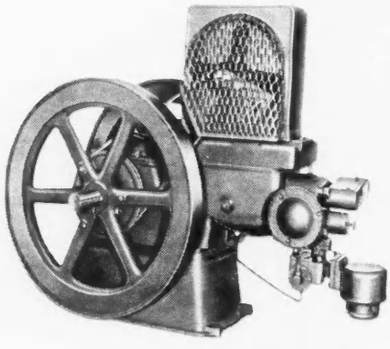
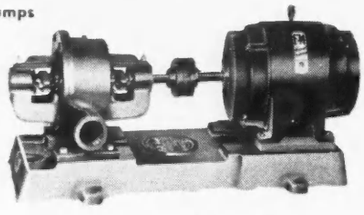


Builtogether Pumps



"ZC" Engine No. 208



Westco Pumps

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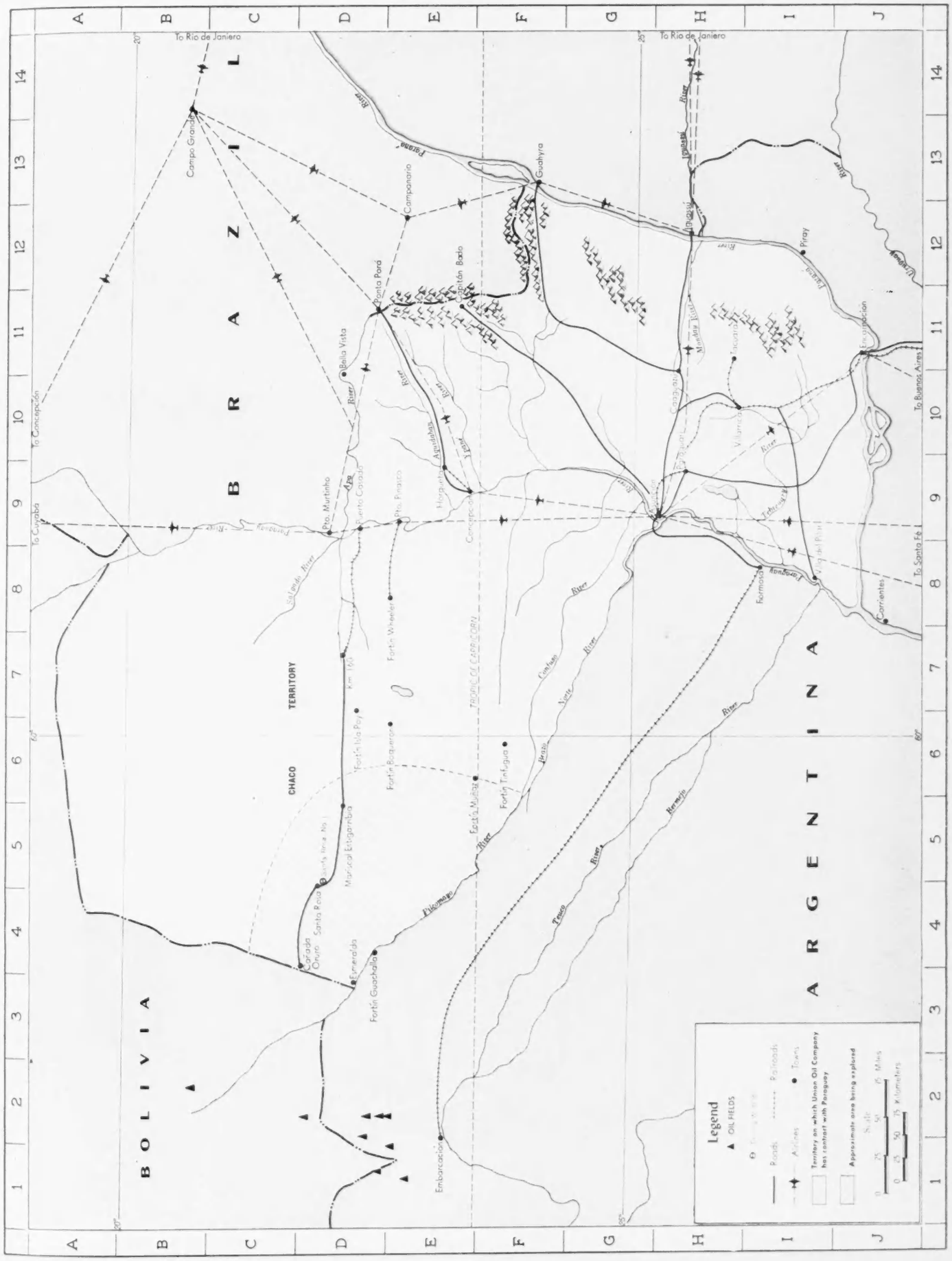
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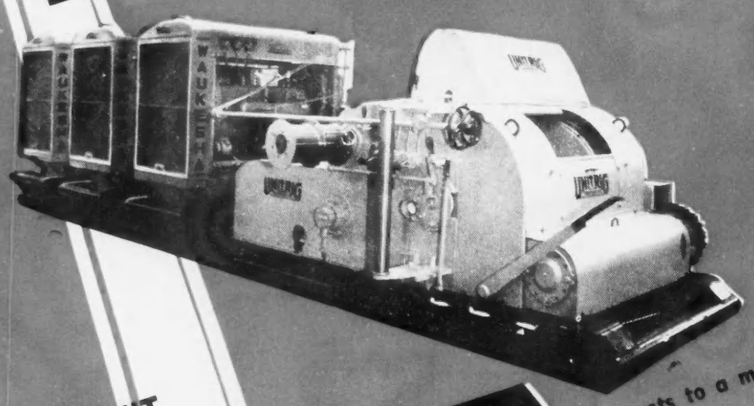

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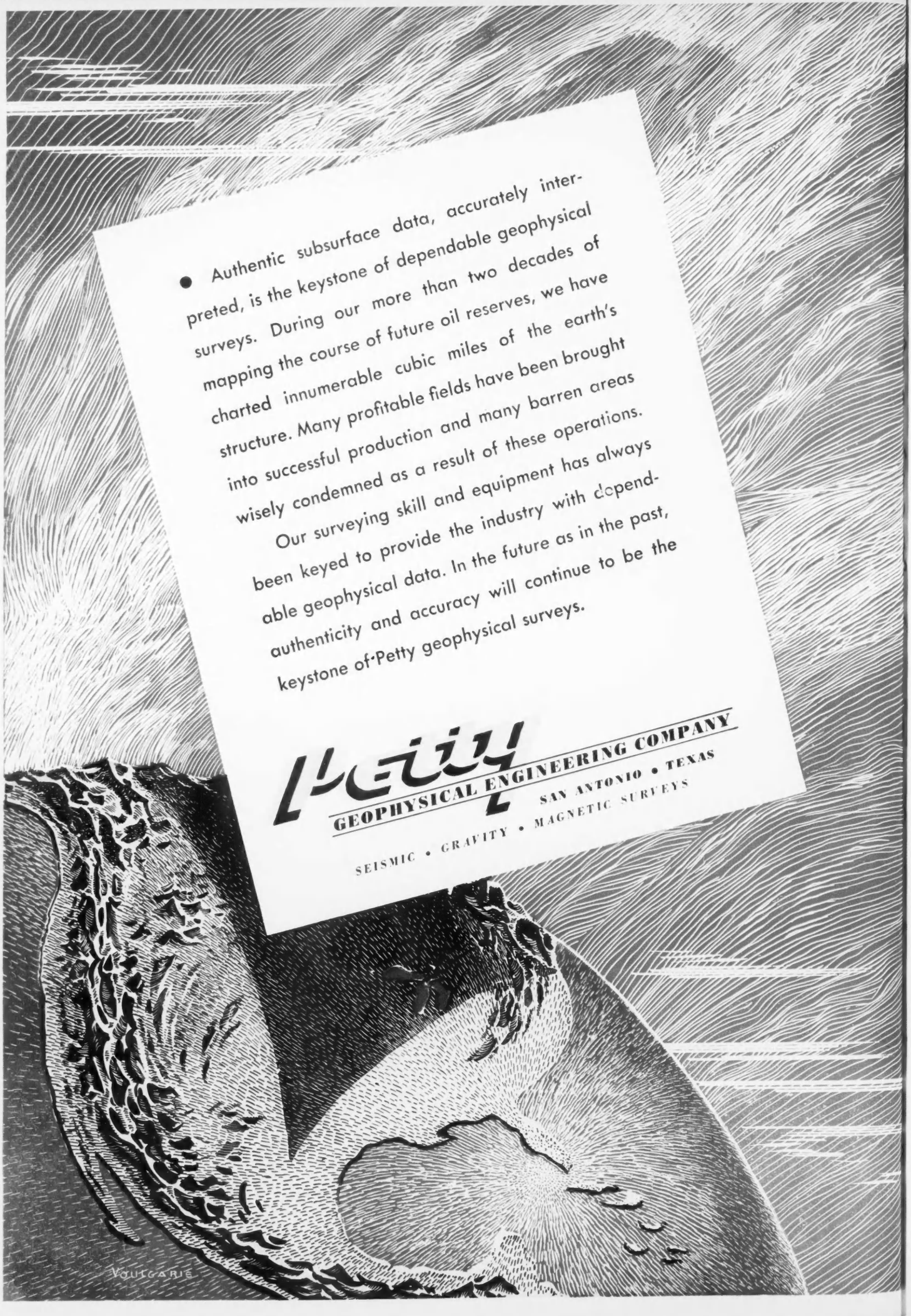
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Rotary tools were used in drilling about 77 percent of the total number of wells completed in 1946. During the year, 32 wells were deepened an average of 526 feet each.

A majority of the oil activity in Peru during 1946 was conducted by the International Petroleum Company in the La Brea-Parinas Estate in Piura Province. The company completed 94 wells for a total drilling of 313,296 feet. The completions included 55 oil wells, three gas wells, and 36 dry holes. Most of the failures were made through unsuccessful attempts to extend the producing area. During the year Cia. Petrolera Lobitos, a British company, completed 30 oil wells in the Restin-El Alto area, Piura Province, but even these completions failed to boost the production substantially. Two wells were completed in the Los Organos field, two at Agua Caliente, and six at Lobitos.

International's Pa Brea-Parinas field produced 10,022,533 barrels in 1946, or about 80 percent of Peru's total output.

The Pirin area, northwest of Lake Titicaca, Puno Province, has not been productive since 1940, but the Peruvian government is presently doing a limited amount of wildcatting with cable tools.

In 1946 the Peruvian government moved in materials for a wildcat test on the Ucayali River, Contamana region, 125 miles north of Agua Caliente, and in a concession in the national reserve area. Meanwhile, Cia. Petrolera de Oriente, a private Peruvian company, was preparing to drill a wildcat test in the same area but across the Ucayali River, on its concession.

The Agua Caliente field, Huanuco Province, operated by Cia. Ganso Azul, maintained its output of about 70,000 barrels annually. At the end of 1946, five wells were flowing with three shut in. The daily output was about 250 barrels.

Producing facilities at the Agua Caliente concession are divided into two main divisions. The "port" area includes a refinery, storage tanks and equipment for transferring oil products to barges. About 2½ miles from the port is "La Cumbre" atop a dome rising several hundred feet above the surrounding jungle. At La Cumbre are the producing wells, the administrative headquarters for technical and supervisory personnel, a small dispensary, machine shop and radio equipment or communication with Lima and Iquitos.

Crude oil from La Cumbre travels through pipe line to the port refinery, a straight-run distillation type, comprising five shell stills capable of processing 400 barrels daily. Agua Caliente oil is of high quality. It has a high paraffin base content of 7 percent and low sulphur content—only one-tenth of one percent.

The Ganso Azul company's market is primarily downriver at Iquitos. Its fleet includes six tugs, four twin-engine and two single-engine; three large barges each with a bulk capacity of 126,000 gallons; 10 barges of 15,000 gallons capacity each; and 10 wooden barges for barreled deck cargo. Marine operations, centralized at Iquitos, are under the supervision of a former commander in the Peruvian Navy.

Peru Oil Regions

There are two important regions of oil exploration in Peru and constitute the petroleum reserves of the state. One is along the sea and the other is in the Amazon forest region. The coastal region is the source of Peru's major oil production. International Petroleum Company has obtained a concession in the Sechura Desert to the south of its production at La Brea-Parinas Estate and is waiting action by Congress. The lower house has approved the contract and action is expected by the Senate at the next regular session in August 1947.

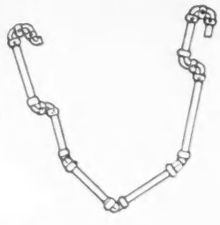
The Amazon forest region is probably the greatest potential oil area in Peru. In this region there are five valleys where evidence of oil has been found and structures favorable for the accumulation of commercial crude oil. The five areas are the valley of the Ucayali River; the valley of the Pachitea

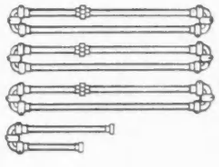
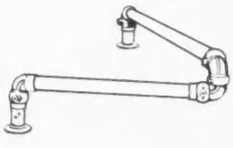
Producing Wells and Oil Production of Peru

FIELD AND PROVINCE	Operating Company	Year of Discovery	OIL WELLS AT END OF 1946				CRUDE OIL PRODUCTION (Barrels)			
			Producing							
			Shut In	Flowing	Art. Lift	Total Producing	Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
La Brea-Parinas, **Piura**	International Petroleum Co.	1889	69	171	1894	2065	26,725	11,278,387	10,022,533	277,224,229
Lobitos, **Piura**	Cia. Petrolera Lobitos	1904	6	28	192	220	2,128	814,337	778,696	62,773,365
Restin-El Alto, **Piura**	Cia. Petrolera Lobitos	1904	14	25	593	619	4,277	1,449,169	1,455,353	
Pirin, **Puno**	Peru Government									286,644
Agua Caliente, **Huanuco**	Cia. Ganso Azul	1939	3	5		5	250	65,259	69,829	271,239
Los Organos, **Piura**	Peru Government	1943			8	8	294	137,064	129,580	3,768,186
Zorritos, **Tumbes**	Peru Government	1883			44	44	46			
Totals			92	229	2731	2960	33,720	13,744,216	12,455,991	344,323,663

Drilling in Peruvian Fields

FIELD AND PROVINCE	Operating Company	WELLS COMPLETED IN 1945					WELLS COMPLETED IN 1946					Field Wells Drilling and Shut Down at End of 1946		
		Oil	Gas	Dry	Total Wells	Total Footage	Oil	Gas	Dry	Total Wells	Total Footage	Dr	SD	Total
La Brea-Parinas, **Piura**	International Petroleum Co.	69		14	83	253,720	55	3	36	94	313,296	21	9	30
Lobitos, **Piura**	Cia. Petrolera Lobitos	6		1	7	21,052	5		1	6	21,689	5	1	6
Restin-El Alto, **Piura**	Cia. Petrolera Lobitos	17		1	18	36,304	30			30	65,517	9		9
Pirin, **Puno**	Peru Government											2		2
Agua Caliente, **Huanuco**	Cia. Ganso Azul						2			2	1,936			
Los Organos, **Piura**	Peru Government	2			2	1,277	2			2	1,277	3		3
Zorritos, **Tumbes**	Peru Government													
Totals		94		16	110	312,353	94	3	37	134	322,715	40	10	50

CHIKSAN *All-Steel* Rotary Hose  has proved its safety and economy under the most severe conditions.

CHIKSAN Circulating Heads have won acceptance by peerless performance and economy. The CHIKSAN Mud Gun is the acknowledged leader among all mud guns. CHIKSAN Cementing Hose  is used as standard equipment by leading cementing companies. Petroleum products are loaded and unloaded quickly and safely through CHIKSAN Marine and Barge Hose  And CHIKSAN *Ball-Bearing* Swivel Joints are used in refineries on loading racks for tank cars and tank trucks, on transfer lines to storage tanks . . . wherever flexibility is required. All these CHIKSAN Products are illustrated and described in the new Chiksan Catalog. Write for your copy today.

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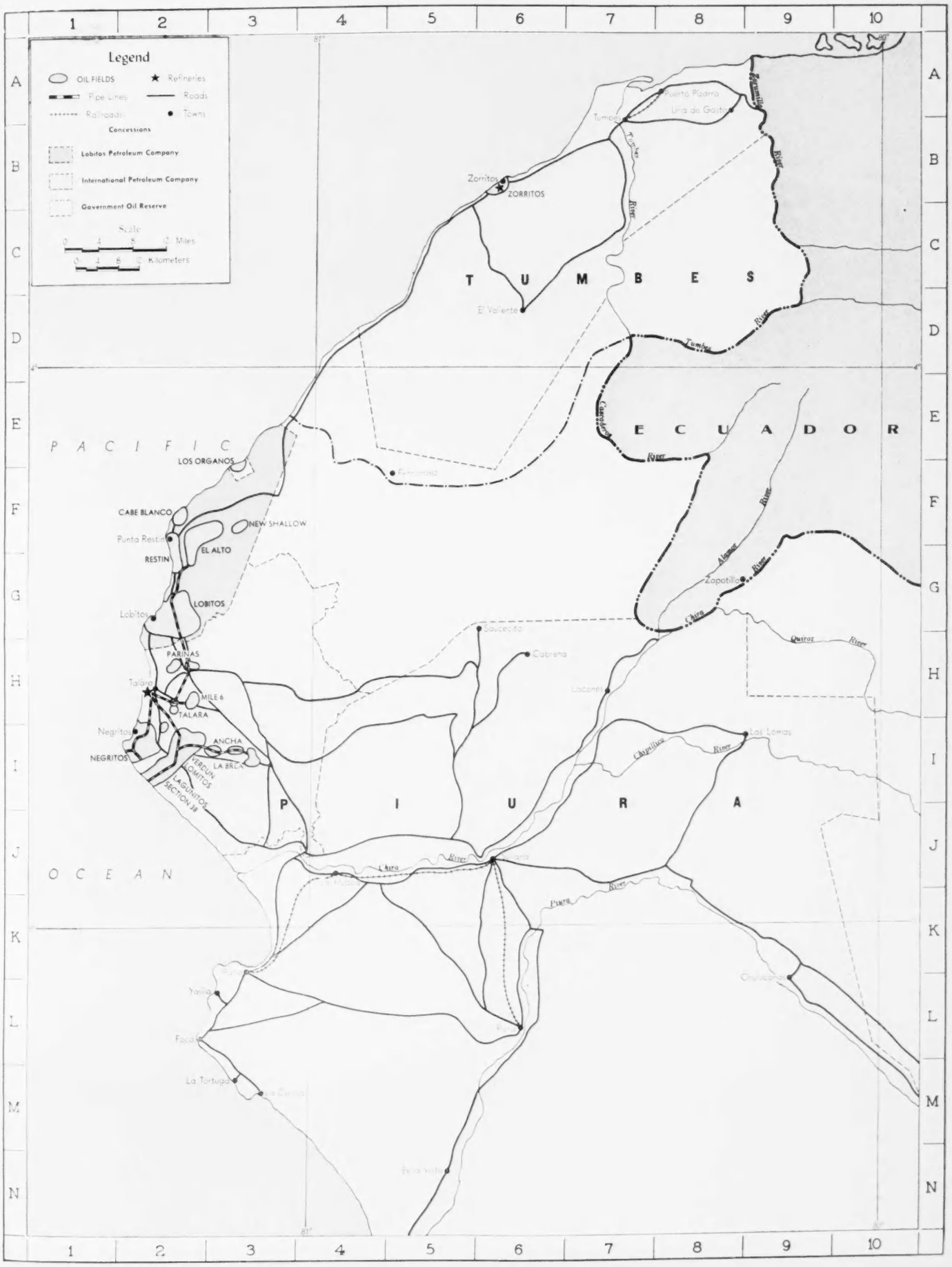

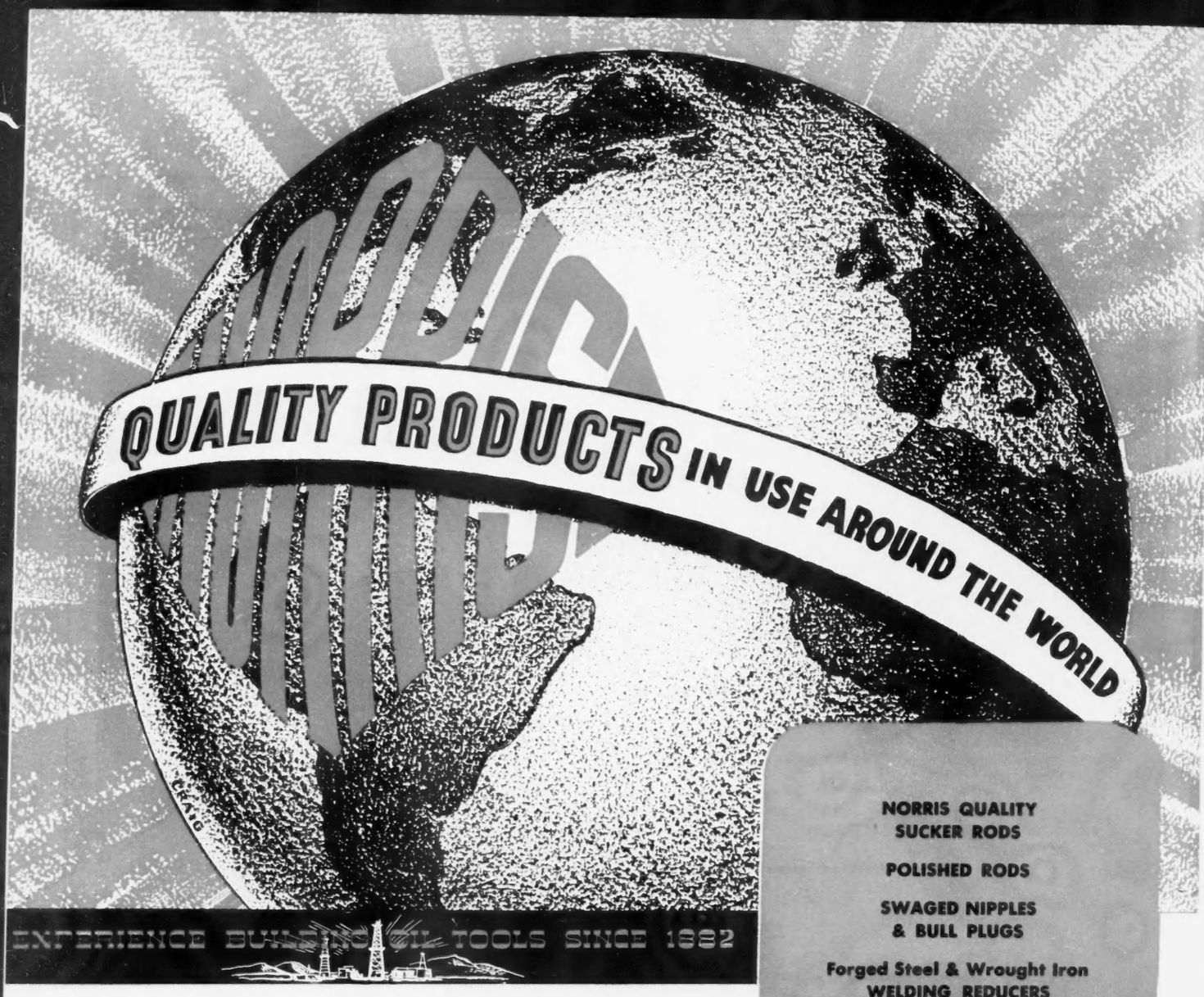

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River, whose chief city is Agua Caliente where Cia. Ganso Azul now has production; the valley of the Huallaga River in the heart of Peru; the valley of the Maranon and Santiago rivers, and the valley of the Madre de Dios River.

Each of these regions is geographically independent with the rivers running through them being the chief means of communication. These regions were explored by the Standard Oil Company in 1923.

New Oil Legislation

The Peruvian legislature has approved the constitution of the "Corporacion de Petroleo" (Corporation of Petroleum) and an organization is being formed which it is hoped will better develop the nation's petroleum industry.

The corporation will have a capital of 200,000,000 soles (about $30½ million) besides the yearly petroleum income. Its mission will be to explore, develop, refine and commercialize petroleum.

The corporation does not monopolize the potential oil of the nation. Its aim will be to stimulate the development of the oil resources of the nation, without opposing or interfering in any way the development of individual capital, which is not only necessary but indispensable in order that the country may profit from its petroleum wealth.

Operating Companies

Four companies, including the government-owned firm, have production in Peru. The government company is Establecimiento Industrial de Petroleo de Zorritos and operates the Zorritos and Los Organos (Constancia) fields. The fields produced 129,580 barrels of oil in 1946, a slight decrease from the output in 1945.

Cia. de Petroleo Ganso Azul (United States) has concessions totalling about 90,000 acres on which is located the Agua Caliente field in Huanuco Province.

Peru Crude Oil Production by Companies

(In Barrels)

YEAR	International (Canadian) Fields[1]	Lobitos (British) Fields[2]	Peruvian Government Fields[3]	Ganso Azul (U. S.) Fields[4]	Total Peru
1935	14,796,914	2,259,966	49,675		17,106,555
1936	15,126,490	2,417,557	49,102		17,593,149
1937	14,722,753	2,695,048	39,214		17,457,015
1938	13,137,988	2,660,022	40,000		15,838,010
1939	10,806,881	2,651,282	49,350		13,507,513
1940	9,626,831	2,431,477	67,957		12,126,265
1941	10,362,395	1,507,208	53,221	13,750	11,936,574
1942	11,089,506	2,469,902	41,850	27,201	13,628,459
1943	12,055,908	2,529,232	39,766	29,592	14,654,498
1944	11,763,068	2,496,782	80,736	45,325	14,385,911
1945	11,278,382	2,263,506	137,064	65,259	13,744,216
1946	10,022,533	2,234,049	129,580	69,829	12,455,991
Totals	144,789,649	28,616,031	777,515	250,956	174,434,156

[1] Includes La Brea-Parinas. [2] Includes Lobitos, Restin-El Alto. [3] Includes Zorritos and Los Organos. [4] Includes Agua Caliente.

Lobitos Oilfields, Ltd. (British), through its subsidiary, Compania Petrolera Lobitos, has a concession of about 131,000 acres on which are located the Lobitos, Restin and El Alto fields in Piura Province.

International Petroleum Company, Ltd. (Canadian), has fee lands in Piura Province on the Pacific Coast, west of the Andes. The company has several producing areas on the La Brea-Parinas Estates and also operates pipe lines, tank farms, natural gasoline plants and a refinery on the fee lands. Construction of a model industrial city at Talara, port and refining center for International in Peru, are planned by the company.

Refineries

Peru has three refineries, two with small capacities, as well as natural gasoline plants in the La Brea-Parinas and Lobitos fields.

The largest refinery is operated by International Petroleum Company at Talara. The plant has a crude charging capacity of 27,000 barrels with an additional cracking capacity of 2000 barrels. During 1946, the crude runs totaled 10,583,151 barrels. The company's natural gasoline output is about 900,000 barrels a year.

The Peruvian government has a 1000-barrel daily topping plant in the Zorritos field with actual runs in 1946 totaling 336,985 barrels.

The other plant is operated by Cia. Ganso Azul at Agua Caliente. Crude runs in 1946 totaled 89,473 barrels.

New Plant Planned

With its major sales located in Iquitos, Ganso Azul is beginning to extend its marketing activities down the Amazon River to Manaos, Brazil, where it is considering the establishment of a refinery jointly with Brazilian interests.

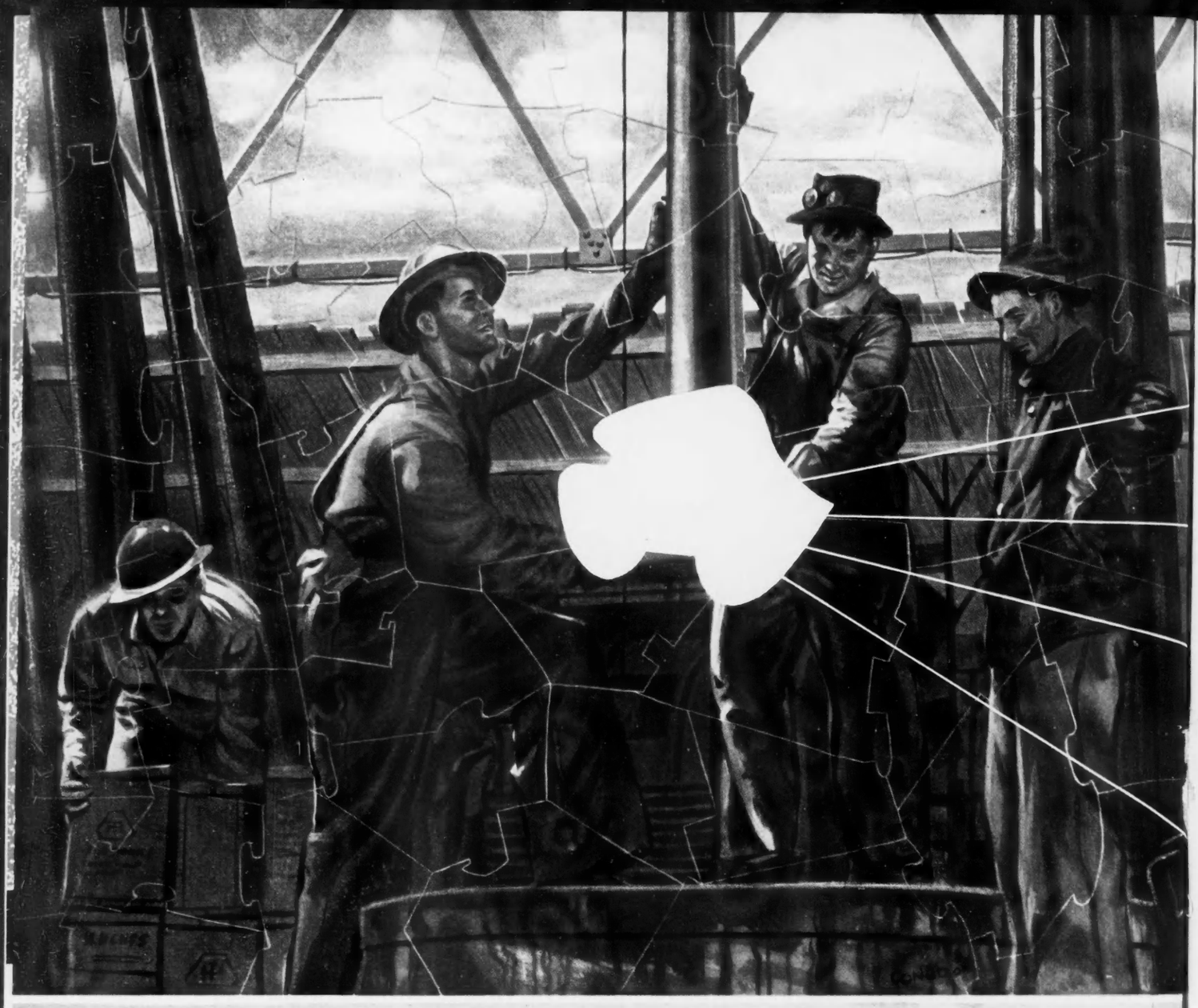
Peruvian refineries in 1946 produced a total of 11,393,757 barrels of petroleum products. The output included 3,589,272 barrels of gasoline, 908,666 barrels of kerosine, 3,081,130 barrels of diesel oil, 3,666,946 barrels of heavy fuel oil, 57,263 barrels of lubricating oil, 36,794 barrels of asphalt, and 53,686 barrels of other products.

Refineries of Peru

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Crude Runs in 1946 (Bbls. Annual)	Type of Refinery	Operating Status
International Petroleum Company	Talara	27,000	2,000	10,583,151	Complete	Operating
Refineria Villar Establecimientos Petroliferos Fiscales	Zorritos	1,000	None	336,985	Topping	Operating
Cia. Ganso Azul.	Agua Caliente	1,000	None	89,473	Skimming	Operating
Totals	3 Plants	29,000	2,000	11,009,609		

Engineering and Geological Data on Peruvian Oil Fields

FIELD AND PROVINCE	Est. Proved Area (Acres)	Gravity of Oil (API)	PRODUCING FORMATION						
			Local Name	Kind	Geologic Age	Depths of Wells (Feet) Minimum Top Pay	Depths of Wells (Feet) Maximum Depth Wells	Average Thickness of Pay (Feet)	Type Structure
La Brea-Parinas, **Piura**	18,600	36.1	Verdun-Talara-Parinas-Salina	Sand	Eocene	60	6000	170	Faulted and Folded
Lobitos, **Piura**	4750	36.4	Terebratula, Lower Cavento	Sand	Eocene	142	6500		Block Faulting
Restin-El Alto, **Piura**	12,500	36	Terebratula, Lower Cavento	Sand	Eocene	100	6600		Block Faulting
Agua Caliente, **Huanuco**	1000	43-44		Sand	Cretaceous	900	1000	80	Dome
Los Organos, **Piura**		44		Sand	Tertiary	1800	2400	30	Monocline
Zorritos, **Tumbes**		38		Sand	Tertiary	1200	1800	20	Monocline



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VENEZUELA

VENEZUELA strengthened its position as the Number 2 producing nation of the world during 1946 when it reached a new all-time peak output for the third successive year following recessions during 1942 and 1943 caused by shortage of ocean-going transportation. The outlook for 1947 is that it will be called upon for more and more production to fulfill unprecedented demand with a distinct possibility that it may produce upward of 40 to 50 percent more than the 1946 total of 388,486,226 barrels of crude petroleum. This was a 14 percent increase over the 1945 total.

A continuation of the intelligently planned and executed program of intensive development has made it possible to reach the new highs in production and remain within the capacity of the fields to produce without damage. The country through 1946 has produced 3,606,192,307 barrels of which 2,957,683,679 barrels has been drawn from Western Venezuela. Eastern Venezuela, a comparatively new region with the exception of the Quiriquire field, is well established as a major source of petroleum, but its potential has not yet been built up to the three-quarter million daily mark reached by

Producing Wells and Oil Production of Western Venezuela

STATE AND FIELD	Operating Company	Year of Discovery	OIL WELLS AT END OF 1946 Producing: Flowing	Art. Lift	Total Producing	CRUDE OIL PRODUCTION (Barrels): Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
Zulia:									
Cabimas	Creole Petroleum, Mene Grande Oil, Venezuela Oil	1917	123	825	948	78,192	25,676,633	25,846,940	530,711,562
Tia Juana	Creole Petroleum, Mene Grande Oil, Venezuela Oil	1928	197	377	574	169,433	48,893,503	63,242,066	427,929,382
Lagunillas	Creole Petroleum, Mene Grande Oil, Venezuela Oil	1926	174	1,096	1,270	306,261	97,085,806	115,806,079	1,408,702,911
Bachaquero	Creole Petroleum, Mene Grande Oil, Venezuela Oil	1938	221	1	222	48,713	13,604,273	18,265,137	53,492,516
Pueblo Viejo	Creole Petroleum, Mene Grande Oil, Venezuela Oil	1940	21	1	22	6,962	1,600,116	2,569,342	4,463,996
La Paz	Venezuela Oil	1922	21	27	48	54,028	8,048,987	15,296,525	34,617,201
Mara	Caribbean Petroleum	1945	5		5	20,195	1,140,460	3,439,049	4,519,509
Amana	Guasare Oil	1943	1		1			2,384	10,476
Mene Grande	Caribbean Petroleum	1913	6	258	264	35,034	12,831,023	13,114,871	294,168,454
Netick	Orinoco	1943	1		1	265	146,034	99,321	408,691
Concepcion	Venezuela Oil	1925	3	92	95	3,047	1,355,097	1,117,526	30,083,177
Los Manueles	Colon Development	1927	16	5	21	4,608	1,933,271	1,936,791	37,586,940
El Cubo-Tarra	Colon Development		15	81	96	8,336	3,873,340	3,768,008	62,435,017
Rio Palmar (Totumo	Creole Petroleum	1915							141,636
Rio de Oro	Colon Development	1916							3,873
Falcon:									
Cumarebo	Creole Petroleum		33	18	51	4,994	1,884,934	1,775,236	36,169,983
Hombre Pintado	British Controlled Oil	1929		21	21	611	242,225	228,155	3,880,079
El Mene	British Controlled Oil	1921		23	23	453		168,565	23,497,832
Media		1928							1,699,532
Guanaco		1914							1,855,805
Mene de Acosta	Tocuyo Oilfields, Ltd. and North Venezuela Petroleum	1927							851,817
Las Palmas	Creole Petroleum	1929							375,272
Urumaco	Richmond Oil								205,072
Total Western Venezuela			837	2,825	3,662	741,132	218,315,702	266,765,995	2,957,873,733

Oil Wells and Crude Oil Production of Eastern Venezuela

DEPARTMENT AND FIELD	Operating Company	Year of Discovery	PRODUCING WELLS AT END OF 1946: Flowing	Art. Lift	Total	CRUDE OIL PRODUCTION (Barrels): Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
Monagas:									
Santa Barbara	Consolidada	1941	94		94	17,034	7,410,318	7,388,440	26,910,205
Muri	Consolidada	1942	51		51	4,853	3,038,149	2,107,229	7,589,517
Mulata	Creole Petroleum	1941	147		147	27,369	10,830,067	10,100,325	28,213,597
Travieso	Mene Grande Oil	1944	71	1	72	14,511	3,337,141	4,785,842	8,568,802
Travieso-2	Mene Grande Oil	1944	8		8	1,102		299,011	299,011
Jusepin	Creole Petroleum	1938	317	1	318	53,057	17,944,987	19,744,213	74,061,588
Silven (Mata Grande)	Phillips Petroleum	1946	2		2	182		18,894	18,894
Capacho	Creole Petroleum	1945					7,032		7,032
Temblador	Creole Petroleum	1936	66		66	6,326	2,102,317	2,285,770	22,414,825
Caritos	Texas Petroleum	1939	1		1	197	6,334	59,617	260,745
Quiriquire	Creole Petroleum	1928	24	83	107	47,160	14,457,058	18,336,085	258,343,048
Orocual	Creole Petroleum	1933							16,706
Anzoategui:									
La Ceiba	Mene Grande Oil	1946	1		1	68		49,238	49,238
Oficina	Mene Grande and Creole	1933	131	35	166	39,882	15,259,647	13,079,843	108,772,637
Santa Rosa	Mene Grande Oil	1941	5		5	2,117	2,117	572,821	2,761,139
San Joaquin	Mene Grande Oil	1939	27		27	10,881	4,035,738	3,748,900	16,510,238
El Roble	Creole Petroleum	1939	11		11	3,654	1,742,636	1,551,592	11,453,632
Guario	Socony-Vacuum Oil	1940	12		12	5,581	1,709,235	1,800,476	4,497,359
Yopales	Creole Petroleum	1937	2		2	1,320		120,732	279,208
Guara	Mene Grande and Creole	1942	111	1	112	73,970	18,350,871	25,857,201	53,120,569
Guico	Socony-Vacuum Oil	1944	38		38	18,043	2,378,020	5,496,476	8,179,842
Santa Ana	Mene Grande Oil	1936	2		2	1,086	163,916	146,068	985,368
Rincon	Texas Petroleum	1941	4		4	2,162	657,210	807,565	1,625,735
Quiamare	Mene Grande Oil	1943	1		1	180	93,596	73,881	530,801
Leona	Mene Grande Oil	1940	12		12	3,930	733,047	1,803,770	5,247,999
Nipa	Socony-Vacuum, Mene Grande and Creole	1945	8		8	6,919	4,189	992,690	966,879
Terr. Delta Amacuro:									
Pedernales	Creole Petroleum	1935							9,036,014
Tucupita	Texas Petroleum	1945	9		9	3,545	15,076	401,858	416,934
Guarico:									
Las Mercedes	Petrolera Las Mercedes	1943	*26		26	185	15,851	63,112	90,368
Pirital	Atlantic Refining		1		1	45		21,984	56,445
Tucupido	Atlantic Refining	1945				213		6,596	6,596
Total Eastern Venezuela			1,182	121	1,303	345,572	104,840,562	121,720,229	651,321,571

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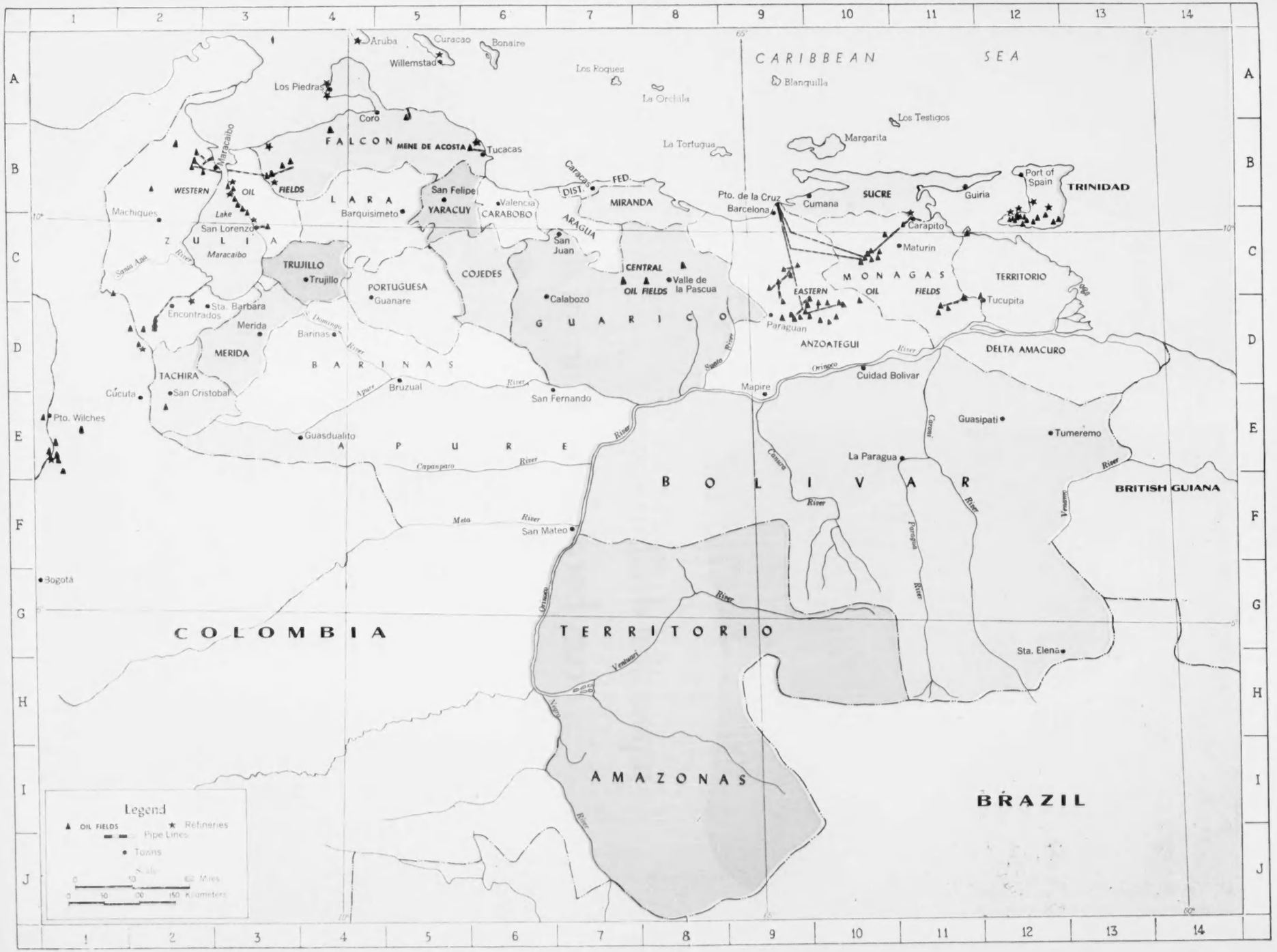
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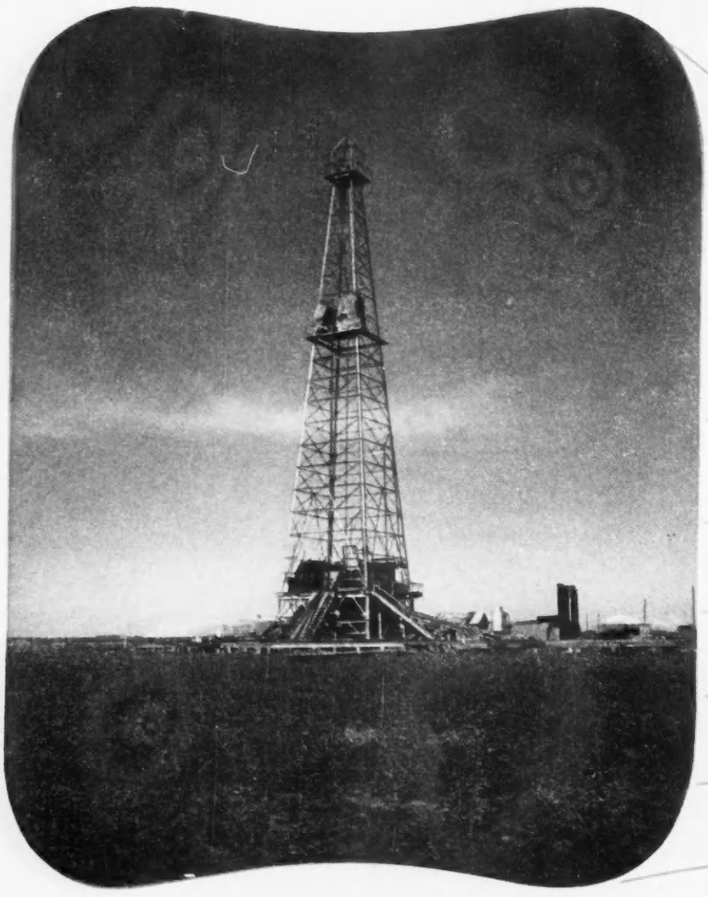
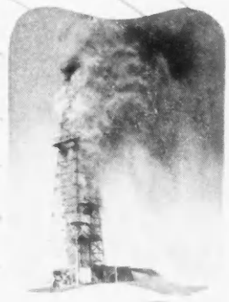
VENEZUELA



In

the twinkling of an eye



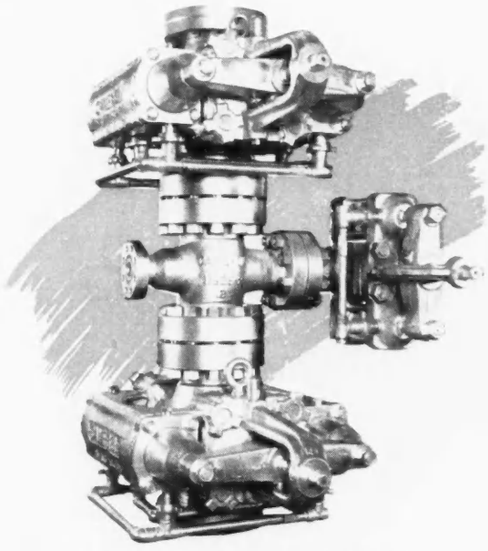
-- a peaceful drilling scene

can become a picture of disaster

While blowouts can and often do happen on the best regulated rigs, the chance of losing control of a well has been lessened appreciably by two noteworthy post-war contributions to drilling control: Cameron Type "QRC" (Quick Ram Change) Pressure-Operated Blowout Preventers and Cameron Type "HCR" (High Closing Ratio) Pressure-Operated Gate Valves. Without these two Cameron units no drilling well is as safe as it could be, and, considering the high cost of blowouts, the cost of replacing obsolete and inadequate equipment with these latest models is negligible.

While the Cameron Type "QRC" Pressure-Operated Blowout Preventers have been available for some time in the higher pressure range, it was only recently that the new Type "HCR" (High Closing Ratio) Gate Valve was announced to the industry, thus matching the "QRC" Preventer with an equally efficient means for protecting the flow-line.

A feature common to both the blowout preventer and gate valve is the more favorable ratio of closing pressure to well pressure . . . 8 to 1 as compared to 3 to 1 on earlier models. Only 1000 lbs. closing pressure is required to close the preventer or the valve against approximately 8000 lbs. well pressure. Furthermore, the Type "HCR" Valve, having a 4 to 1 ratio of *opening* pressure to well pressure, may be easily opened against high well pressures should it become necessary to relieve pressure through the flow-line.



A Cameron Type "HCR" Pressure-Operated Gate Valve is shown flanged to the flow-line outlet of a drilling spool in a Cameron 10,000-lb. test hook-up. Note that pressure cylinders similar to those of the Type "QRC" Blowout Preventer, are provided for operation of the valve.

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VENEZUELA—Continued

the Maracaibo Lake Basin, but results of exploratory drilling in recent years has been sufficiently encouraging to allow optimistic hopes for its future.

The Eastern Venezuela region is currently producing nearly 350,000 barrels daily, and in certain areas has almost reached the limit of local transportation arteries. Early in 1947, work was being planned for additional facilities to correct this situation, and by the middle of the summer there should be sufficient capacity in pipe lines to allow for increases in production.

Thirty-seven wildcat tests drilled in Eastern Venezuela, including Guarico, resulted in the opening of fields at Nipa, La Ceiba, Caico Seco and Tucupido in addition to extensions at Mercedes, Guico and Travieso. On the basis of current indications, Nipa is the most important of the new discoveries, being quite similar in character to the Guara-Guico fields with multiple sands in the Oficina formations. Of significance also is the opening of the Tucupido field by Venezuelan Atlantic Refining Company and Pantepec in Guarico. This is the central Venezuela area where millions of acres are under exploratory concession and where wildcatting will be brisk as soon as the new Guarico road is completed to permit drilling equipment to be hauled to difficult areas.

The Jusepin-Mulata-Santa Barbara group of fields were extended on the west end by Phillips Venezuelan Oil Company's FT-1 in the Mata Grande area during the year to mark that company's first entry into the list of Venezuela producers. By drilling three wells it had been estimated near the close of the year that approximately 40 locations had been proved. An equal number had been proved across the concession line to the east on acreage held by Mene Grande Oil Company. The remainder of the region has been fairly well defined, and is in the phase of steady fill-in development with step-out drilling having failed to extend the fields materially.

Quiriquire field, the oldest of Eastern Venzuela's producing areas, added an estimated 100 million barrels plus to its reserve by deeper flank drilling which proved the original

Venezuela Crude Production—(In Barrels)

	WESTERN DISTRICT		EASTERN DISTRICT		ALL VENEZUELA	
	Annual Total	Daily Average	Annual Total	Daily Average	Annual Total	Daily Average
1940	137,759,571	376,392	48,694,610	133,046	186,454,181	509,438
1941	165,493,292	453,406	62,079,062	170,080	227,572,354	623,486
1942	106,536,286	291,880	40,972,094	112,253	147,508,380	404,133
1943	144,832,532	396,801	34,540,363	94,631	179,832,895	492,693
1944	183,180,705	500,494	73,835,234	201,735	257,015,939	702,229
1945	218,315,702	598,125	104,840,562	287,234	323,156,264	885,359
1946	266,765,995	730,866	121,720,229	333,480	388,486,224	1,064,346

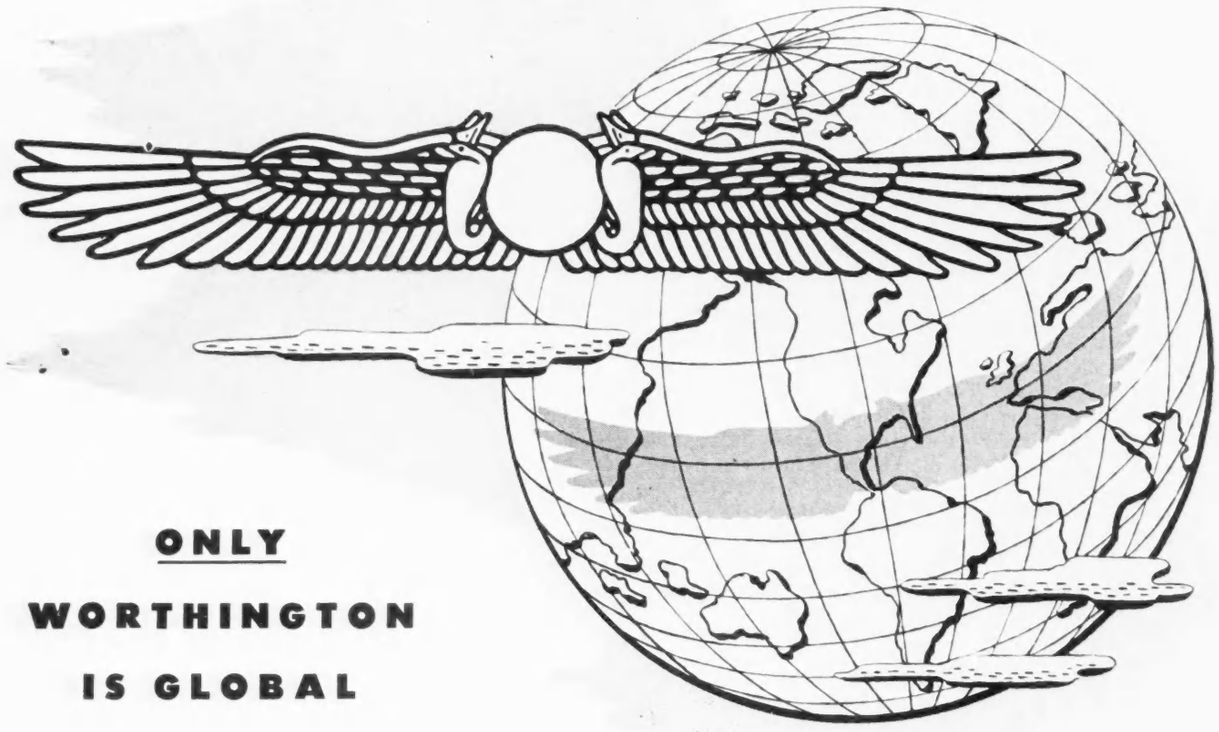
Wildcats Completed in Venezuela in 1946

DEPARTMENT	Company and Well	Date Completed	Total Depth Feet	Results
Anzoategui.	Socony-Vacuum's Tascabana 1	1–9	7950	Gas well, no gauge.
Anzoategui.	Mene Grande's La Ceiba 1	3–30	9244	La Ceiba discovery. 360 B/D ¼" choke.
Anzoategui.	Mene Grande's Ca M-1, Caico Seco	1–14	8515	Discovery, perf 5686-5700, IP 515 bbl. day, ¼" ch. Grav. 49.7. Officina sand.
Anzoategui.	Mene Grande's G.M. 4	2–19	7077	Extension. Dual comp 5709-27 & 6270-80 ft. 731 B/D, ¼" chokes.
Guarico	Atlantic & Pantepec's Tucupido 1	12–27	9855	Discovery. IP 432 B/D 3/8" choke. Gravity 40.9.
Guarico	Barnsdall's Manguito 1	3–22	4937	Dry.
Guarico	Barnsdall's Cabaceras 1	5–29	4418	Dry. Oil shows 3422-4200 ft.
Guarico	Barnsdall's San Jose 1	7–13	3937	Dry.
Guarico	Barnsdall's Cocuiza 1	9–3	5150	Dry.
Guarico	Barnsdall's Lejara 1	10–11	5023	Dry.
Guarico	Barnsdall's San Cristobal 1	11–2	4380	Dry. Show heavy oil, tar sands.
Guarico	Creole's XB-1, Sombrero Area	9–12	6202	Dry.
Guarico	Creole's XB-2, Sombrero Area	7–9	5709	Gas well. No gauge.
Guarico	Creole's XB-3 Sombrero Area	11–25	6319	Dry.
Guarico	Creole's XB-4, Sombrero Area	9–1	6539	Dry.
Guarico	Texas Petroleum's Grico 1	3–27	5036	Extension oil well—no gauge.
Guarico	Texas Petroleum's Grico 3	7–30	4798	Dry.
Guarico	Texas Petroleum's Camaz 2	11–13	9054	Dry.
Monagas.	Atlantic-Pantepec's San Pedro 1	7–16	8200	Dry.
Monagas.	Atlantic-Pantepec's El Hueso 1.	8–2	8467	Dry.
Monagas.	Atlantic-Pantepec's El Hueso 2 .	10–3	8029	Dry.
Monagas.	Atlantic-Pantepec's Toncro 1	7–6	10002	Dry.
Monagas.	Atlantic-Ref.'s Tacat 1 .	6–9	6019	Dry.
Monagas.	Consolidada's SB-124	3–23	8714	Dry.
Monagas.	Consolidada's SBS 126	7–15	9040	Dry.
Monagas .	Consolidada's Varsa 1	11–9	8536	Dry.
Monagas.	Atlantic-Pantepec's Salva 1	12–9	7799	Dry.
Monagas.	Mene Grande's Tacata 1 .	1–29	8629	Dry.
Monagas.	Mene Grande's Tacata 2	8–2	10237	Dry.
Monagas.	Mene Grande's Tacata 3	11–5	5990	Dry.
Guarico	Texas Petroleum's Grico 2	6–24	4937	Dry.
Guarico	Texas Petroleum's Grico 5	12–16	4739	Dry.
Guarico	Texas Petroleum's Punzon 2	9–8	4123	Dry.
Barinas	Socony-Vacuum's Silvestre 1	3–30	10153	Dry.
Barinas	Socony's Yaure 1, Western Llanos area	6–15	9000	Dry.
Barinas	Socony-Vacuum's Yagre 2	9–2	5933	Dry.
Zulia	Creole's LGE-1, in Lake Maracaibo		8031	Suspended.
Zulia	Creole's LGE-2		8021	Suspended.
Zulia	Creole's LGE-3		7898	Suspended.
Zulia	Creole's LGE-4		8004	Suspended.
Zulia	Creole's LGE-5		8557	Suspended.
Zulia	Richmond's Zulia 1-1		9835	Suspended.
Zulia	Richmond's Zulia 7-1		9598	Suspended.
Zulia	Guasare's Amana 3	8–8	5300	IP 500 B/D, 31-grav. oil. In old area hitherto not commercial.

Drilling in Venezuela

State and Field	WELLS COMPLETED IN 1946 Total Oil[1]	Dry	Wells	Footage	Field Wells Drilling and Shut Down at End of 1946 Dr	SD	Total
WESTERN AREA							
Zulia							
Cabimas	9		9	46,687	6		6
Tia Juana	61	1	62	311,478	3		3
Lagunillas	38		38	213,897	2		2
Bachaquero	91		91	336,292	10		10
Pueblo Viejo	16		16	51,210	1	1	2
La Paz	8		8	50,102	3	1	4
Mene Grande	12		12	74,064	2		2
Tarra-El Cubo	14	1	15	29,062	2		2
Netick						1	1
Mara	3		3	19,230	1		1
Concepcion					1	1	2
Amatra	1		1	5,300	2		2
Los Manueles	1		1	4,720			
Wildcat Tests		7[2]	7[2]	59,944			
Falcon:							
Cumarebo	2		2	4,635	...		
Hombre Pintado					...		
Barinas							
Wildcat Tests		3	3	35,086			
Total Western Area	256	12	268	1,241,647	33	4	37
EASTERN AREA							
Monagas							
Santa Barbara	18		18	102,810	1		1
Muri	1		1	4,700			
Mulata	35	3	38	211,200	4		4
Travieso	27	3	30	183,822	8		8
Travieso 2	9		9	55,812	1		1
Jusepin	90	4	94	489,990	5		5
Hilven (Mata Grande)	2	2	4	13,230	3		3
Capacho							
Temblador							
Caritos							
Quiriquire	15	1	16	85,241	3		3
Wildcat Tests		12	12	99,632			
Anzoategui							
La Ceiba	1		1	9,244	1		1
Oficina	11	1	12	79,200			
Santa Rosa	2		2	15,064	2		2
San Joaquin	6		6	39,010	2		2
El Roble	1		1	10,240	1		1
Guario	5		5	39,500	1		1
Yopales							
Guara	38		38	252,560	4		4
Guico	22		22	155,400			
Santa Ana		1	1	6,230	2		2
Rincon							
Quamare							
Leona							
Nipa	8	2	10	74,983	6		6
Caico Seco	3	1	4	24,301	1		1
Wildcat Tests	2		2	15,027			
Terr. Delta Amacuro							
Pedernales							
Tucupita	6		6	35,400	1		1
Guarico							
Las Mercedes	13		13	57,244	4		4
Tucupido	1		1	6,855			
Wildcat Tests	2	11	13	71,502			
Total Eastern Area	318	41	359	2,138,164	59		59
Grand Total	574	53	627	3,379,811	83	4	87

[1] Includes both oil and gas. [2] These tests actually suspended.



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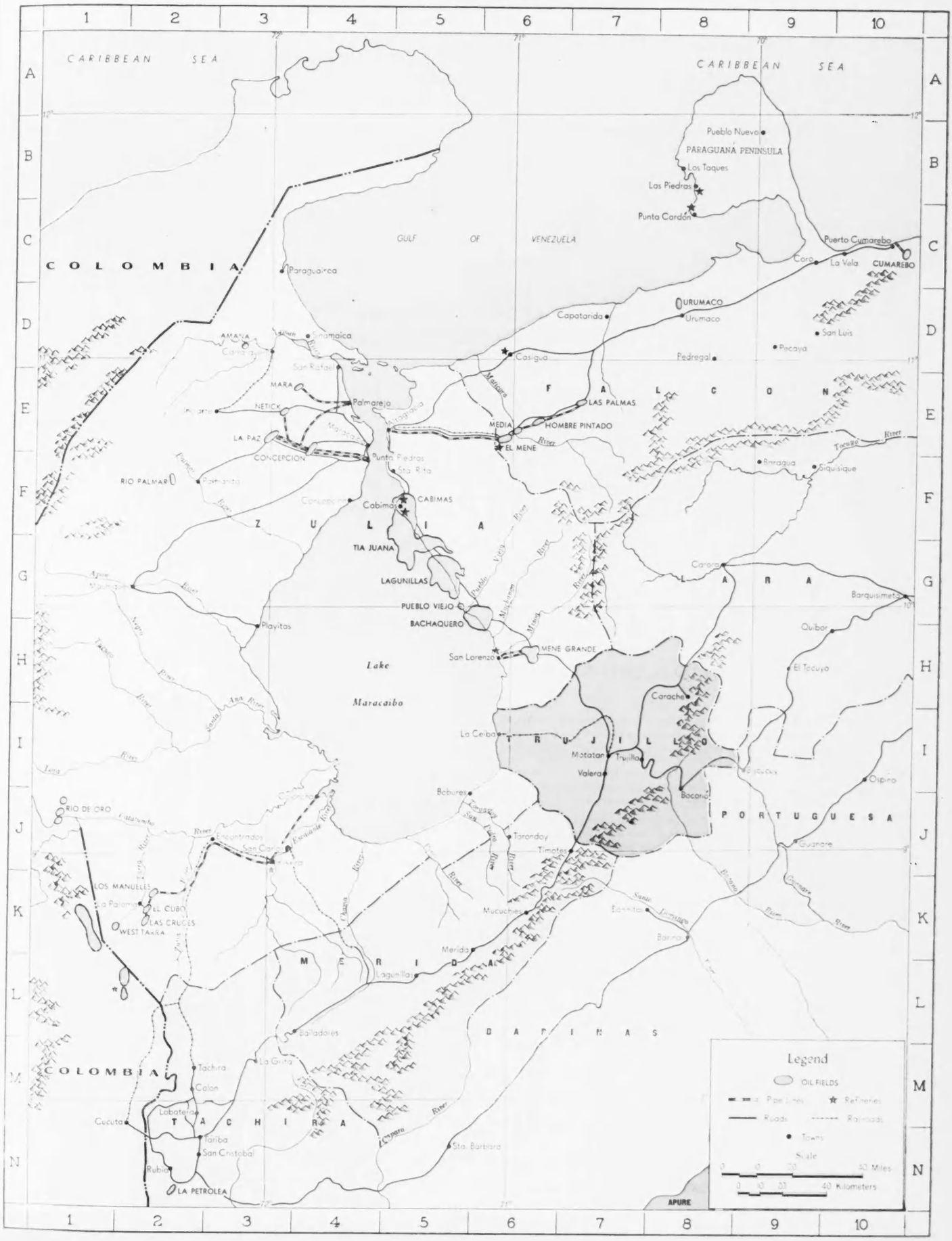
THE SIGN OF VALUE AROUND THE WORLD

VENEZUELA—Western Fields



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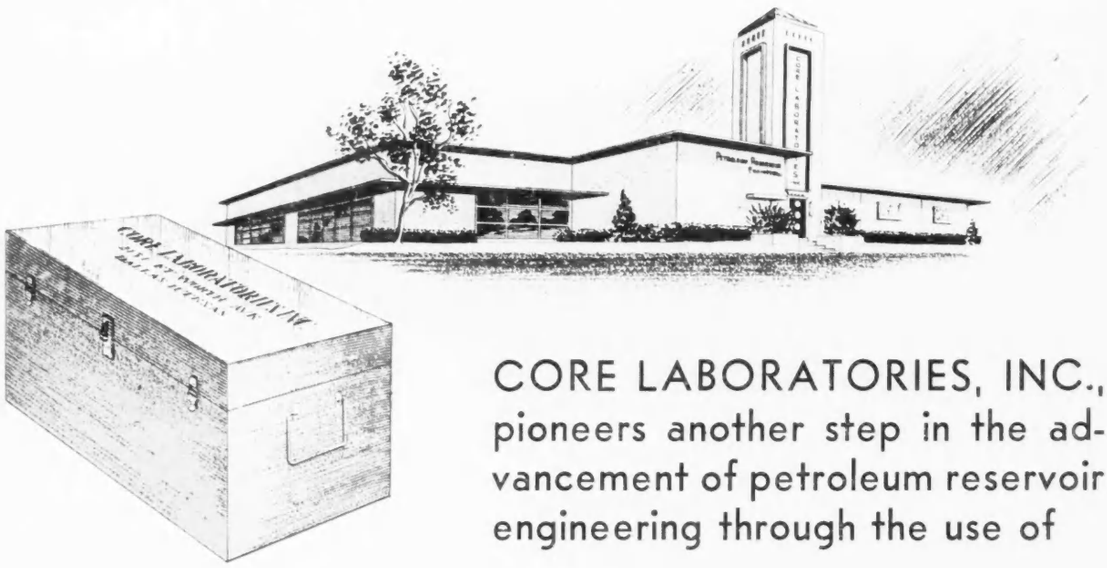

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field pay to be productive on the flanks where it had not been fully prospected heretofore. This filed had produced 258,343,648 barrels from discovery in 1928 to the end of 1946.

Perhaps the best future prospects in Eastern Venezuela for presently producing areas is held for the Greater Oficina area, where sporadic wildcatting has been very successful. Many areas in which the first well proved productive also have not received further development because activity was being concentrated in areas such as Oficina proper and Guara. At least a dozen such areas have been found, having good oil production and good sand conditions. The near future should see renewed activity designed to define these fields. Heretofore the development has been concentrated in the areas nearer base camps and pipe lines.

An example of the growth of the close-in areas is the Guara field, which saw most of its development during the past three years. In 1944 it produced less than 9 million barrels, jumped to nearly 20 million in 1945, and during 1946 Guara and Guico together, all on the same structure, produced more than 31.2 million to become the third producing area in Venezuela, surpassed only by Lagunillas with its 115,896,000 barrels and Tia Juana with 63,242,000 barrels.

The year also marked beginning of shipments by Texas Petroleum Company from its new Tucupita Field in the Delta Amacuro territory of extreme Eastern Venezuela.

Exploration in Eastern Venezuela during 1946 followed a pattern largely of a search for new and deeper producing horizons along the area north of the Jusepin field, and of extreme importance early in 1947 was the report of showings in a Consolidada well indicative of possible deep Cretaceous production north of the Santa Barbara field.

During the year, expansion of Socony-Vacuum Oil Company's production at Guico and at Guario allowed this company to supplant Compania Consolidada de Petrolea as the fourth producer in the country behind Creole, Mene Grande Company, and the Shell Group. All of Socony's production is in the east, while all of Shell's is in the west.

Although Eastern Venezuela production is not inconsiderable, Western Venezuela continues as the area which will furnish substantial quantities of additional oil. The produc-

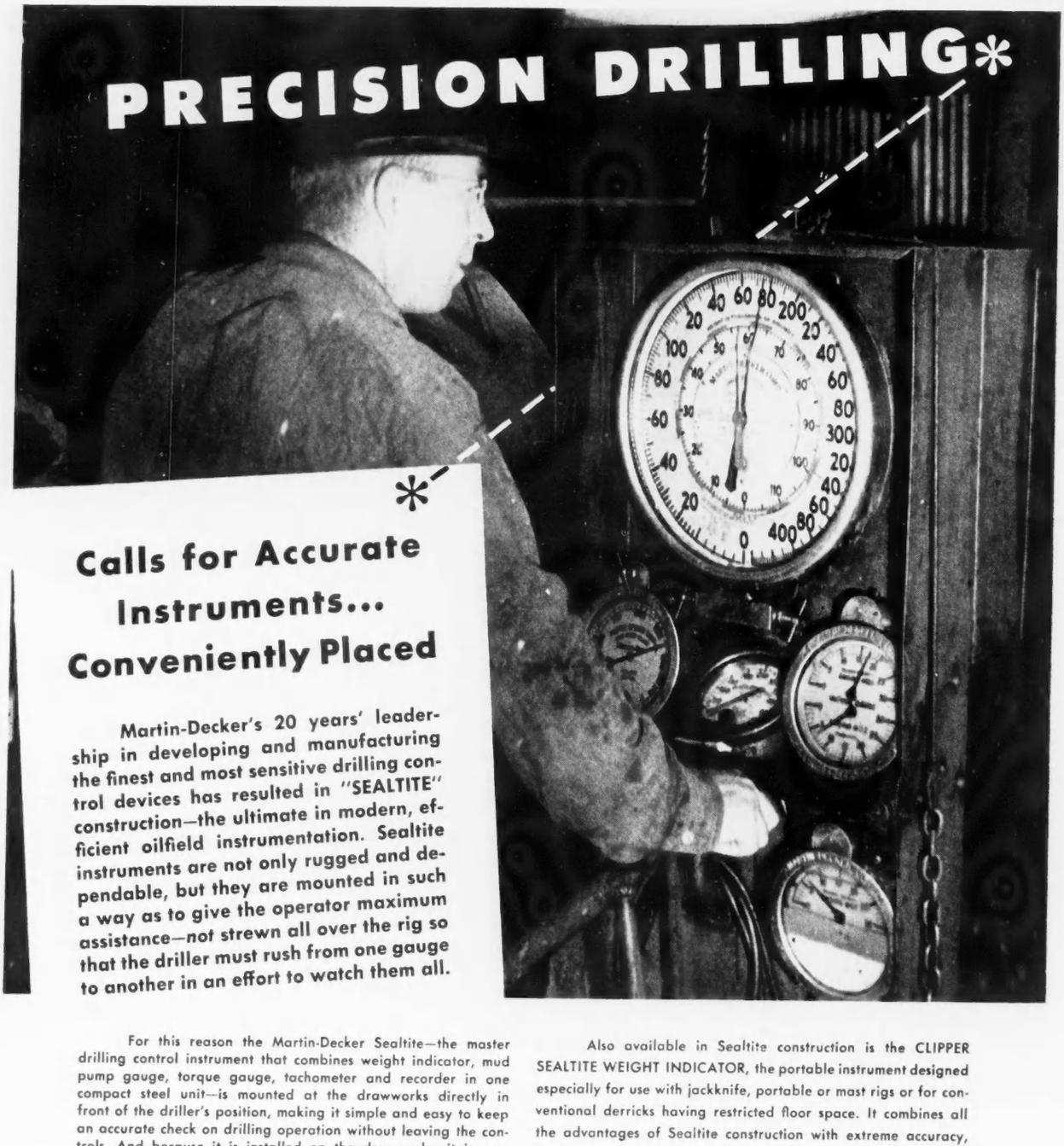
Engineering and Geological Data on Eastern Venezuela Fields

STATES AND FIELDS	Proved Area Acres	Gravity of Oil API	PRODUCING FORMATION Name	Kind	Age	Depth of Wells Ft. Minimum Top Pay	Maximum Total Depth	Average Thickness of Pay Feet	Type Structure
Monagas:									
Quiriquire	10,253	19	Quiriquire	Clay Sand	Pliocene	2624	3940	157	Fault.
Temblador	4,600	21	Oficina	Fine Sand	Miocene	3600	3930	43	Fault.
Jusepin	17,000	33	Jusepin	Fine Sand	Miocene	4590	4670	82	Anticline
Santa Barbara	2,315	27-30	S. Barbara	Fine Sand	Miocene	5900	6560	125	Monocline
Elven (Mata Grande)	300	25		Fine Sand	Miocene	5700	6100	35	Monocline
Mulata	7,240	33	Mulata	Fine Sand	Miocene	5240	5900	62	Strat. Trap.
Muri	800	32	Muri	Loose Sand	Miocene	3280	3600	43	Monocline
Travieso 2	500	31		Fine Sand	Miocene	5600	6200	40	Monocline
Anzoategui:									
Oficina	12,266	25	Oficina	Fine Sand	Miocene	4590	5900	20	Monocline
Guico	2 650	38	Oficina	Fine Sand	Miocene	5200	7000	40	Monocline Faulted
Guara	3,350	15-37	Guara	Fine Sand	Miocene	5200	6560	45	Monocline
Leona	1,100	26	Leona	Lutitas	Miocene			26	Fault.
Nipa	750	33-38	Oficina	Fine Sand	Miocene	7400	7600	50	Anticline Faulted
El Roble	9,100	54	Roble	Sand	Oligocene			33	Anticline
La Ceiba	150	37.3		Sand	Miocene-Oligocene	5400	7000	20	Anticline
San Joaquin	7,692	43	S. Joaquin	Clay Sand	Miocene-Oligocene.	6230	6560	50	Anticline
Santa Rosa	1,670	42	S. Rosa	Fine Sand	Miocene-Eocene	7546	10400	20	Anticline
Terr. Delta Amacure:									
Pedernales	972	21	Pedernales	Loose Sand	Miocene	1550	2500	248	Anticline
Tucupita	600	16.5		Loose Sand	Miocene	5550	6000	35	Anticline

Engineering and Geological Data on Western Venezuela Fields

FIELDS, BY STATES	Proved Area (Acres)	Probable Enlargement	Gravity of Oil (API)	PRODUCING FORMATION Name	Kind	Age	Depth of Wells (Ft.) Minimum to Top of Pay	Maximum Total Depth of Wells	Average Thickness of Pay (Feet)	Type Structure
Falcon:										
Camarebo	540		48	Socorro	Lent. Sand	Miocene	1950	3000	30	Anticline
El Mene	1008		33	Agua Clara	Sandstone	Miocene	1120	1600	50	Anticline
Media	62		34	Agua Clara	Sandstone	Miocene	3280	3900	50	Fault
Hombre Pintado	92		24	Agua Clara	Sandstone	Miocene	2460	2630	60	Anticline
Las Palmas	50		34	Monte Claro	Sandstone	Oligocene	2750		55	Anticline
Zulia										
Amana (Guasara)	500		31.5		Sand	Eocene	3188	4500	40	Anticline
Dto. Bolivar (Creole)	95249		16-30	La Rosa, Lagunillas of Bachaquero	Clay Sand	Mio-Oligocene			17-150	Monocline
Cabimas (VOC)	13190		22	La Rosa Lagunillas	Clay Sand	Mio-Oligocene	2200	3600	85	Monocline Anticline
Cabimas (MGO)	2471	780	15-27	Lagunillas Icotea	Clay Sand	Mio-Oligocene	1600	3600	15-100	Monocline
Lagunillas (VOC)	18920	1160	16	Lagunillas Icotea	Clay Sand	Mio-Oligocene	2500	4000	66	Monocline
Lagunillas (MGO)	2717	638	11-18	Lagunillas Icotea	Clay Sand	Mio-Oligocene	2500	4000	14-144	Monocline
Bachaquero (VOC)	3000		14	Lagunillas Icotea	Clay Sand	Mio-Oligocene	2800	6000	98-215	Monocline
Bachaquero (MGO)	1246	549	13-17	Lagunillas Icotea	Clay Sand	Mio-Oligocene	2800	6000	13-110	Monocline
Mene Grande (CPC)	8645		22	Pauji	Clay Sand	Miocene	3050	4550	60-540	Anticline
Tia Juana (VOC)	5434	445	13	Lagunillas	Clay Sand	Miocene	2850		164	Monocline
Tia Juana (MGO)	1174	231	12-24	El Mene	Clay Sand	Miocene	2850		18-140	Monocline
Tarra (CDC)	2470		19-33	Mirador	Sandstone	Eocene	2300		65-213	Monocline
Los Manueles (CDC)	420		30-39	Mirador	Sandstone	Eocene	3900		39	Dome
La Paz (VOC)	1359		24-34	La Paz	Sandstone	Eocene-				
				La Luna Cogollo	Limestone	Cretaceous	1900	2950	180	Anticline
La Concepcion (VOC)	2470		37	Concepcion	Sandstone	Eocene	1700		410	Anticline
Mara	1500		29.5	Cogollo	Limestone	Cretaceous	6400	7000	1500	Anticline
Netick	250		29.2	Horqueta	Sand	Eocene				Anticline
Pueblo Viejo	2500		21		Sand	Eocene	1850	3000	75	Anticline

PRECISION DRILLING*



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Also available in Sealtite construction is the CLIPPER SEALTITE WEIGHT INDICATOR, the portable instrument designed especially for use with jackknife, portable or mast rigs or for conventional derricks having restricted floor space. It combines all the advantages of Sealtite construction with extreme accuracy, maximum portability and minimum rig-up time for quick jobs.

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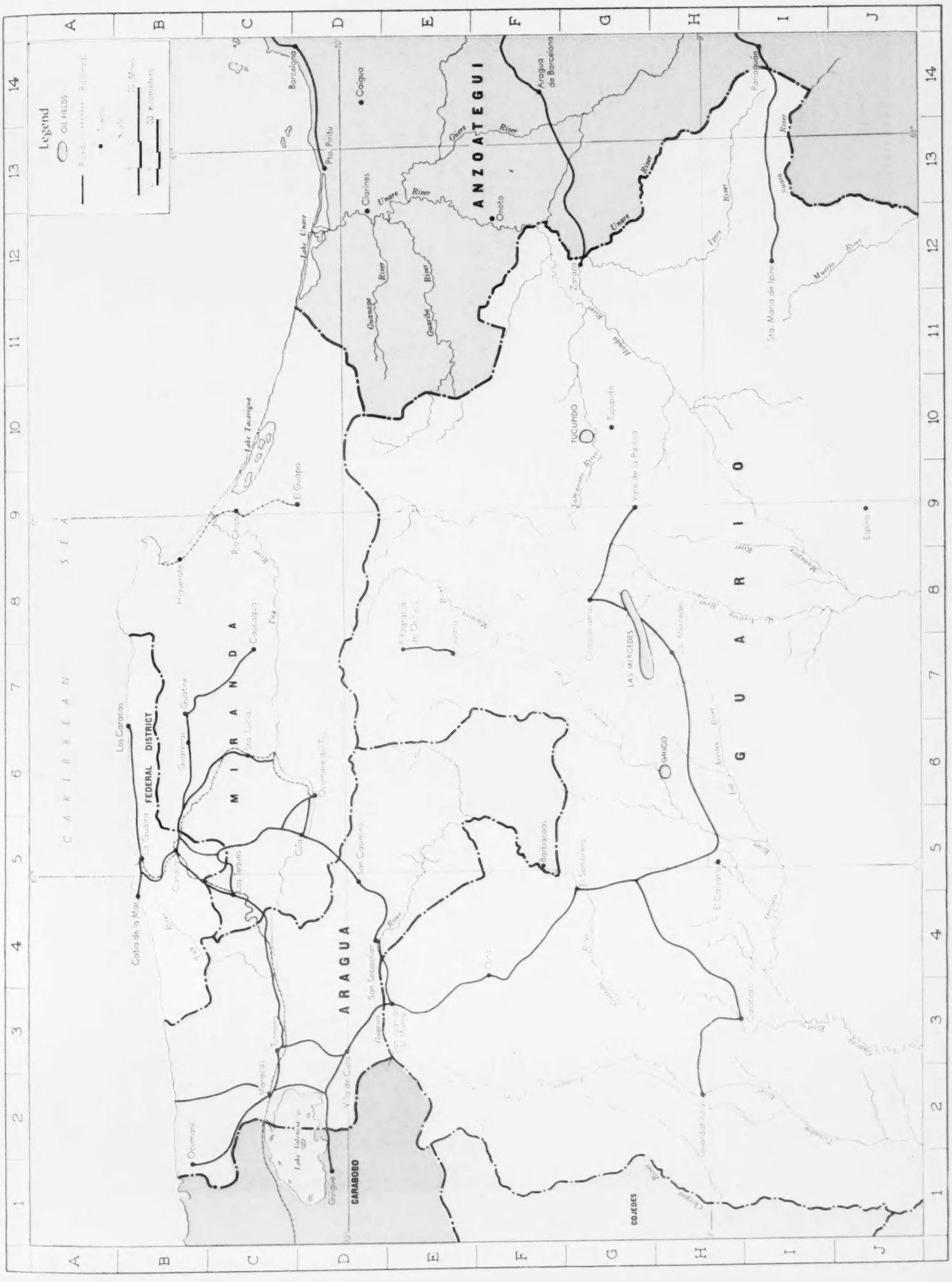
VENEZUELA—Central Fields



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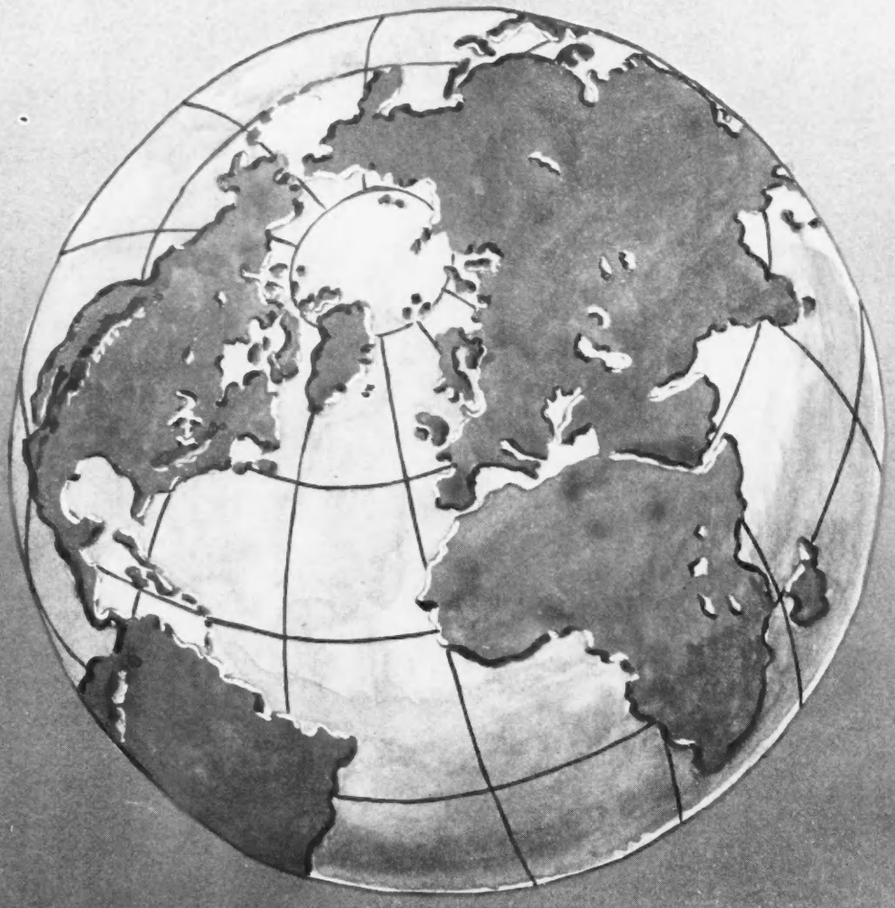

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tion of the Bolivar coastal fields along the eastern shore of Lake Maracaibo is being augmented by increasingly important production from fields discovered during the past two years on the west side of the lake. One of these, the Mara field, opened in 1945 from Cretaceous Limestone, has only three producing wells, but was contributing more than 20,000 barrels daily at the end of 1946. La Paz field is an old shallow Eocene field where deeper drilling in 1945 proved production in the Cretaceous. Potential of this field has been boosted by completion of seven wells to nearly 60,000 barrels daily. Actually it is understood that the potential of these wells has never been fully determined. They seem to produce easily at rates up to 10,000 barrels daily, but there is still insufficient record of performance to judge just how much more each well could make.

At the close of the year it seemed likely that still another Cretaceous area would be opened by the Shell Group southwest of the lake and west of El Cubo-Los Manueles fields. Here the company has already proved the existence of another field by having made a successful test in the top of the formation in its West Tarra 2, but the well is not yet completed.

Drilling Activities

Drilling in Venezuela during 1946 showed an increase of 25.38 percent as compared with 1945 activity, with a pronounced gain in the volume of wildcat drilling. At the close of the year there were 93 rigs active and the programs of most operators for 1947 indicated another healthy increase for the coming year. In all, 652 wells were drilled, including a number of geological structure tests. Field wells numbered 590 of which only 20 were dry holes. The year's exploratory drilling accounted for a total of nine new productive areas, although some of these consisted more in extending and expanding proven fields than in the discovery of entirely new fields. Actually four of the new areas opened production on new structures, all in Eastern Venezuela. No new fields were opened in Western Venezuela although the West Tarra test mentioned above should eventually be completed as an important well, having shown oil at the rate of 2000 barrels daily while testing in the very top of the producing formation. Toward the end of the year this operation was delayed by stuck drill stem and was finally sidetracked at 7659 feet. At the close of the year The Atlantic Refining Company and Pantepec Oil Company had made tests proving productive the Pelayo area, several miles northeast of the Leona field in the Greater Oficina area.

For a number of years, drilling in Venezuela has been confined largely to field development, but late 1945 and early 1946 witnessed an increased interest in exploratory drilling. This was prompted by a desire to open new areas and increase reserves and speeded by the necessity of completing preliminary work on much exploratory acreage held under concession and nearing their expiration dates. The year 1946 started with 37 rigs running in Western Venezuela, but by the end of the year there were 43 active rigs, of which 12 were wildcats. In addition a number of new rigs had been scheduled for delivery, most being earmarked for wildcat operations. Eighteen of the rigs were being operated by the Shell Group which has three active operating subsidiaries in the region.

Of particular interest was the return to active development in the Lake Maracaibo area of Mene Grande Oil Company during 1946. This firm had been running only one rig in 1945 and none in 1944, but early in 1946 had increased its equipment to seven rigs, all being used in field development operations on the east side of the lake. In addition two new heavy rigs have been acquired by the company for wildcats—one east of the south end of Lake Maracaibo in the Poco area, and another on the west side of the lake north of the new Mara field.

Creole Petroleum Corporation has a drilling program mapped out which will call for more equipment than now available, but had added only one new rig to the eight with which it started the year. All of Creole's equipment is especially designed and used for marine operations in the Lake.

New Pipe Lines

Two new pipe lines were built by the Shell Group to serve the new production at Mara and La Paz. Both are 12-inch carriers, one being 15½ miles from Mara to Palmarejo and the other 17 miles from La Paz to Palmarejo where the company is building a new marine terminal to supplant their old offshore loading system.

Another important line is scheduled for construction by Creole. This is a 157-mile combination 26-inch and 24-inch line from the Rio Ule tank farm near Tia Juana field to the site of the company's proposed new refinery on the Bay of Amuay on Paraguana Peninsula. With two pump stations as planned, the line is to have a capacity of 280,000 barrels a day and will augment the present transportation system which is wholly by lake tanker. With completion of this line there will be 400 miles of pipe lines in Western Venezuela, but about half of this total consists of short lines from lake fields to terminals on the lake, and usually considered more as a part of the gathering system than as trunk pipe line systems.

New pipe line work for 1946 included laying of loops north of San Joaquin on Mene Grande's system from Oficina to Puerto la Cruz. The 110-mile, 16-inch line had already been looped part of the way and addition of new 16-inch loops during 1946 brought a capacity to 160,000 barrels daily. Through work in progress at the end of the year, the loop was being extended to Anaco Station and new pumping units had been installed at Oficina and at Anaco stations, so that capacity is being raised to between 180,000 and 200,000 barrels daily.

During the early part of 1947, Socony-Vacuum Oil Company had started preliminary work on a 78-mile 12-inch line from Guico to connect with the Consolidada line from Santa Barbara to Puerto la Cruz. The new line will boost capacity from the Greater Oficina area by 75,000 barrels daily.

Refineries of Venezuela

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
Creole Petroleum Corporation	Caripito	70,000	35,000	Complete	Operating
	La Salina	12,000		Skimming	Operating
Mene Grande Oil Company	Cabinas	1,800		Skimming	Operating
	Oficiana	830		Skimming	Operating
	San Lorenzo	37,800		Skimming	Operating
Shell Group	Casigua	700		Skimming	Operating
	La Rivera	200		Skimming	Operating
	El Calvario	200		Skimming	Operating
British Controlled Oilfields, Ltd	Mene de Mauroa	250		Skimming	Operating
Socony-Vacuum Oil Company	Guario	120		Skimming	Operating
Total Operating	10 plants	123,900	35,000		
Shell Group	Punta Cardon	40,000	40,000	Complete	Building
Creole Petroleum Corp	Bay of Amuay	70,000		Complete	Planned
Mene Grande Oil Co.	Puerto la Cruz	20,000		Complete	Planned
Sinclair Oil Company	Puerto la Cruz	35,000		Complete	Planned
Total Planned and Building	4 Plants	165,000	40,000		
Total All	14 Plants	288,900	75,000		

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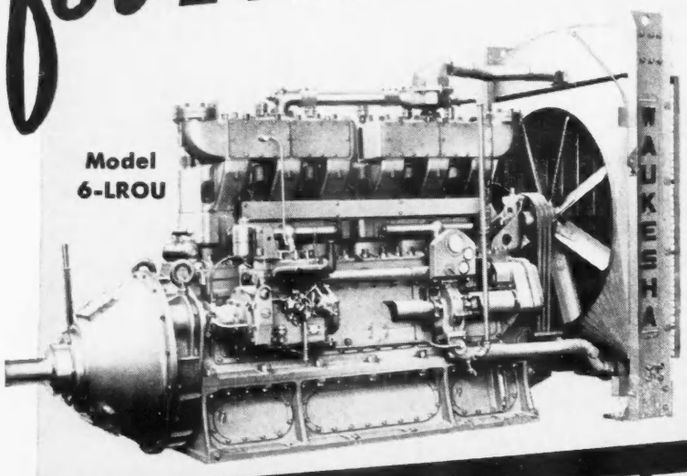

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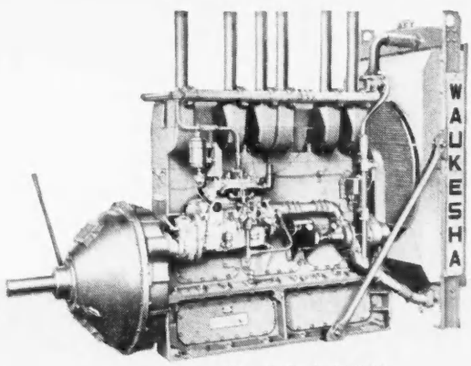
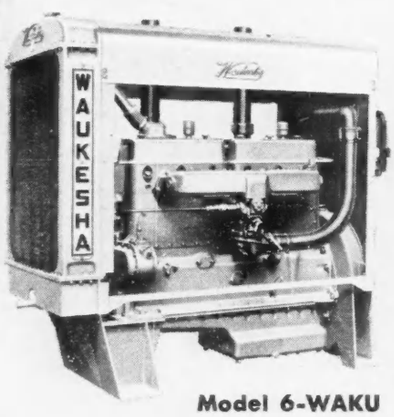
6-WAKU	6	6¼ x 6½	1197	1300-1600
145-GKU	6	5¼ x 6	779	1400-1800
140-GKU	6	4½ x 5½	525	1500-1800
6-SRKRU	6	4⅝ x 5⅛	517	1500-2000
6-MZAU	6	4¼ x 4¾	404	1600-2200
6-BZU	6	4 x 4¼	320	2000-2500
VIKU	4	4½ x 5¼	334	1400-1600
XAHU	4	3⅝ x 4½	186	1800-2000
FCU	4	3¼ x 4	133	1800-2600
ICKU	4	2½ x 3⅛	61	2000-2400



Model 6-NKU



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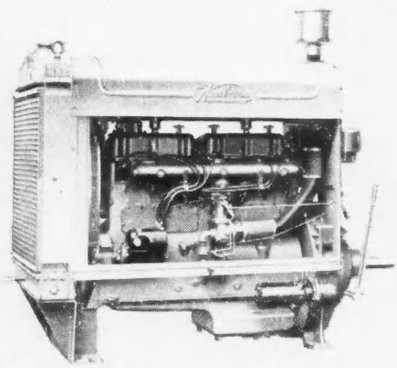
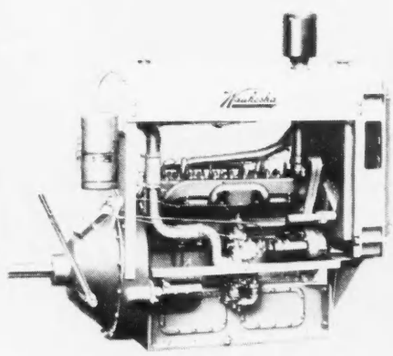


Model 145-GKU



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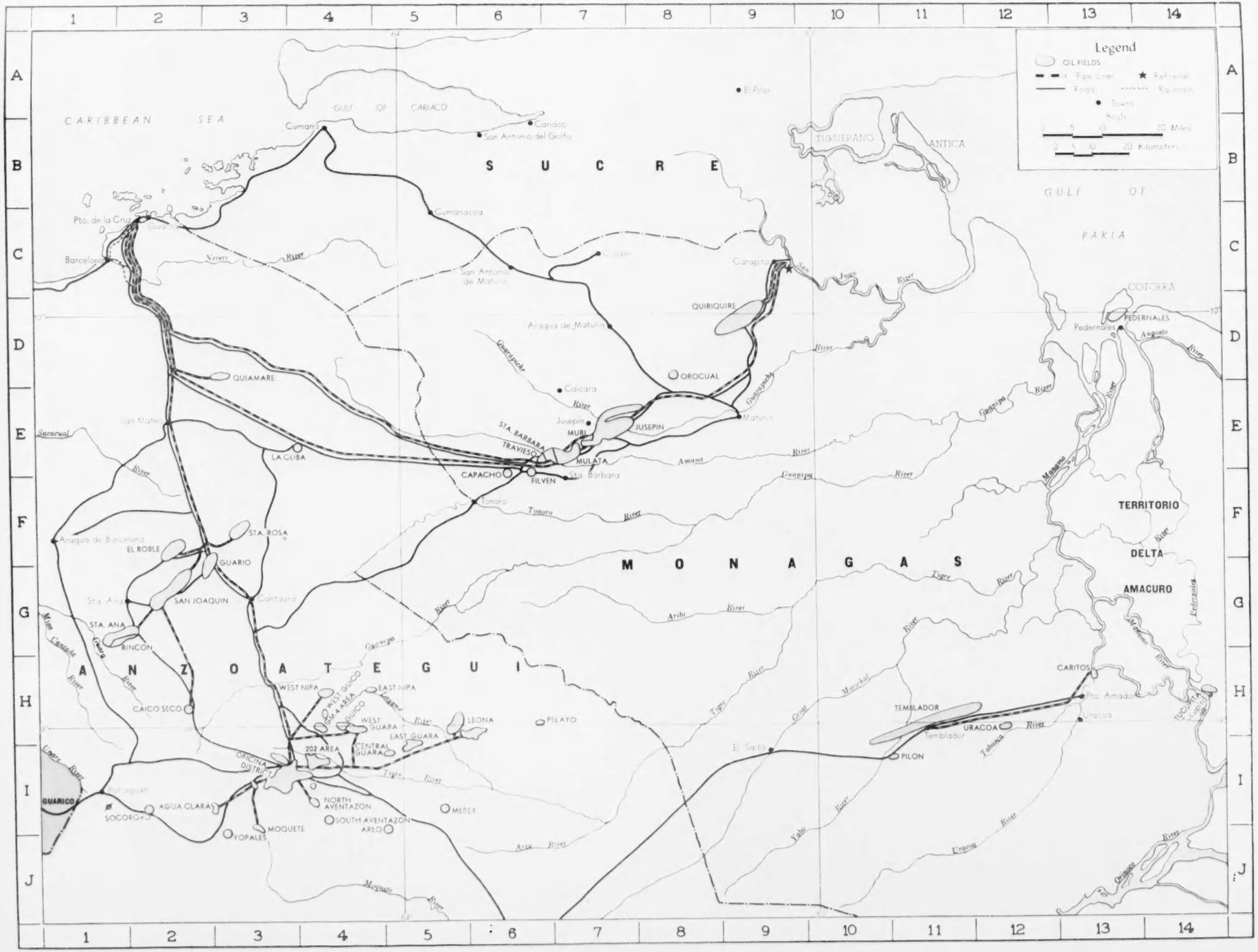
Legend
OIL FIELDS
Pipe Lines
Refineries
Roads
Railroads
Towns
Scale
20 Miles
20 Kilometers
CARIBBEAN SEA
GULF OF CARIACO
GULF OF PARIA
SUCRE
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URACOA
PILON
El Salto
WEST NIPA
EAST NIPA
WEST GUICO
GUICO
EAST GUICO
WEST GUARA
CENTRAL GUARA
EAST GUARA
202 AREA
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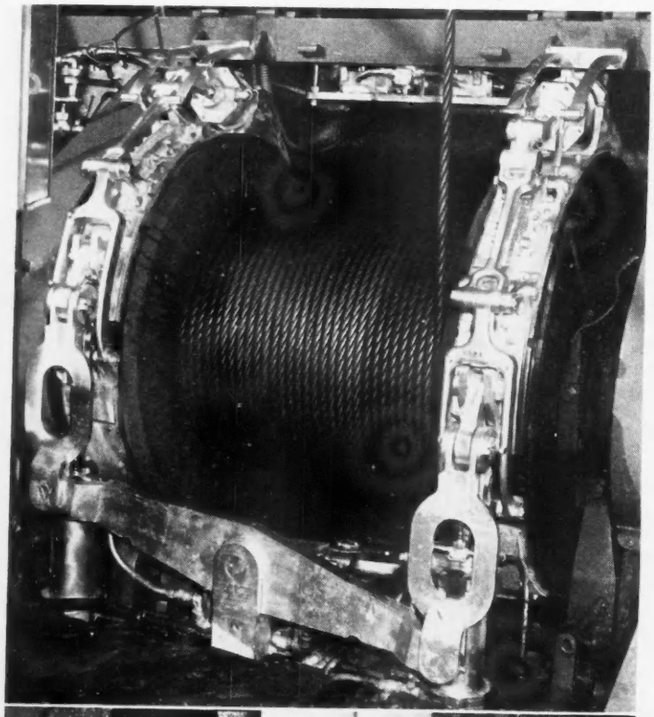

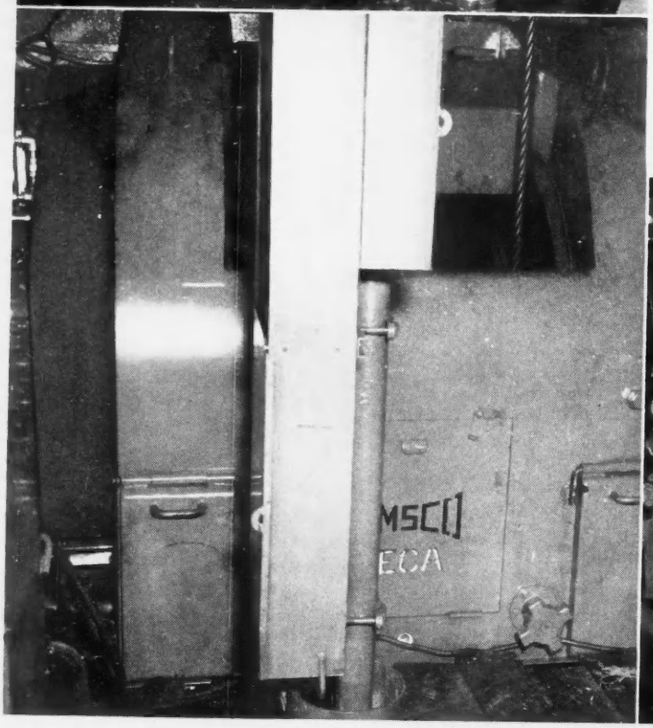

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REDUCES FATIGUE . . . *INCREASES EFFICIENCY*

With Kinzbach Air Brakes, the driller controls the drawworks brake through a simple air control lever, which may be operated with a minimum of effort. Since he no longer has to go off balance to apply the brake, he has more time and is in better position to attend to throttle, clutches, cathead and other controls. While making trips, driller can work in closer co-ordination with the crew, thus increasing overall efficiency of operations.

CLOSER CONTROL OVER PIPE . . . *INCREASES SAFETY*

Longest strings of pipe can be easily handled with Kinzbach Air Brakes. They are capable of tremendous energy absorption, yet are smooth in application and a sense of "feel" is retained in the control lever. Greater safety for men and equipment results, because the driller is always in full command of the load on the blocks. Manual brake lever remains in operative position, and can be applied at any time.

CONTROLS PENETRATION RATE . . . *INCREASES ECONOMY*

Hydraulic Payoff Control permits selection of most economical penetration rates, up to 70 feet per hour with 10 lines. Payoff is accomplished *without band slippage*, thus reducing wear on brake bands and drum.

SIMPLE AND ADAPTABLE TO ANY RIG

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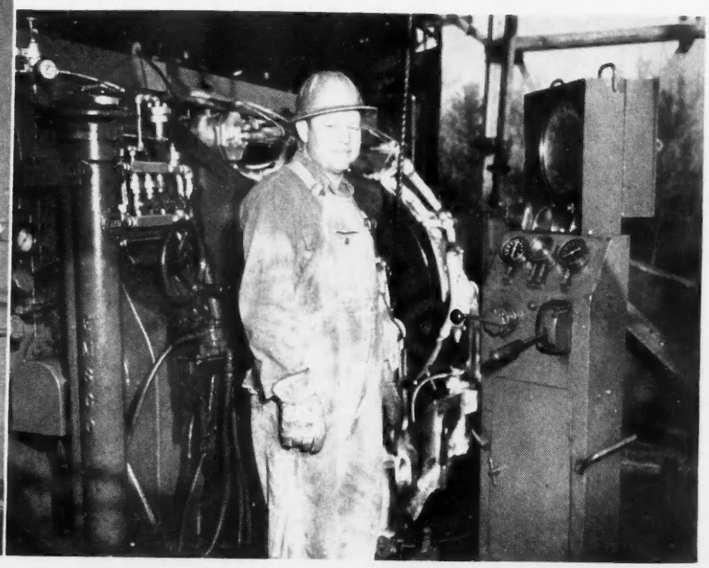
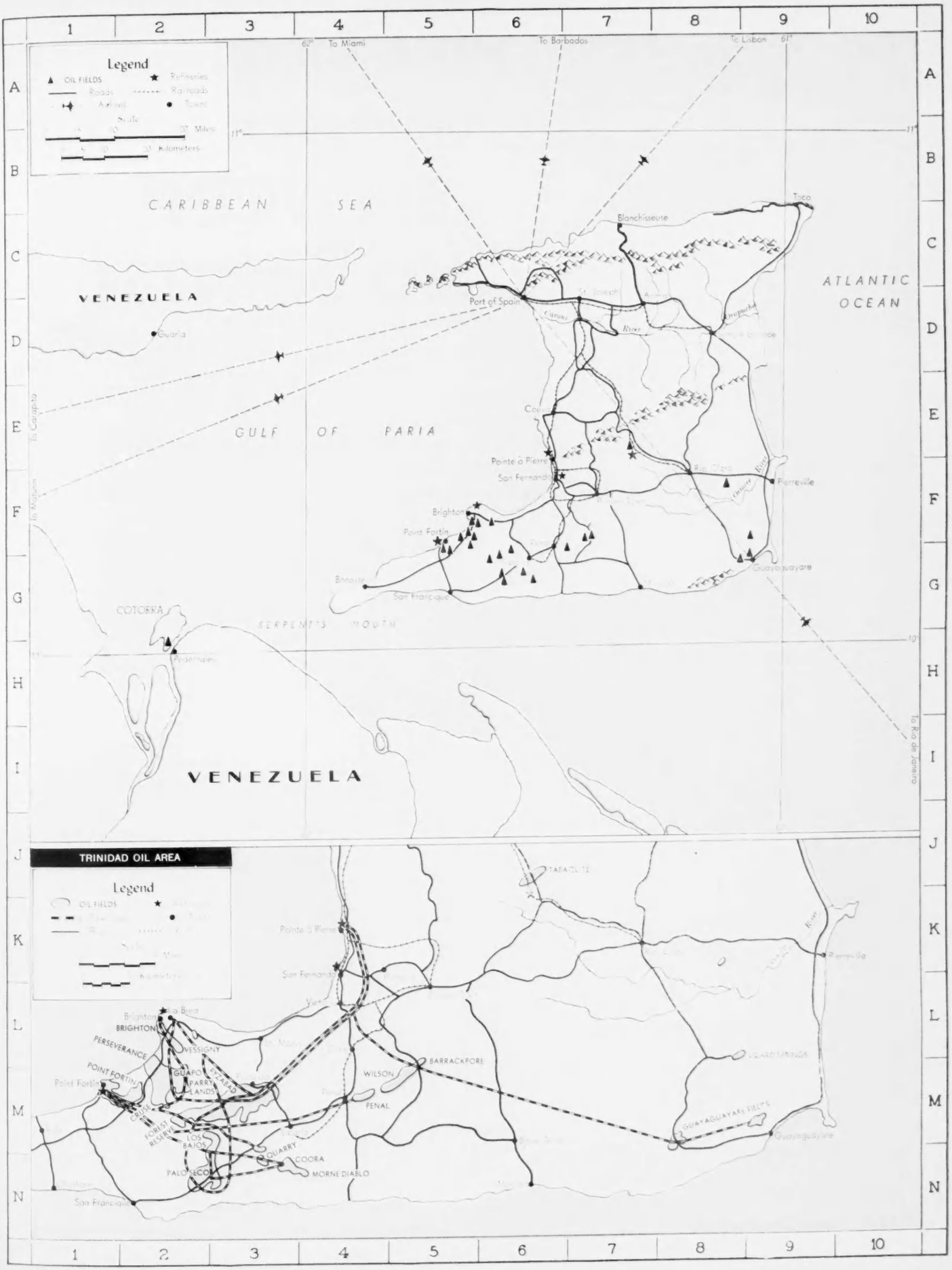
Kinzbach Air Brakes are available for quick delivery and will be installed under supervision of trained service men. Inquire for full particulars.



KINZBACH

TRINIDAD—Fields



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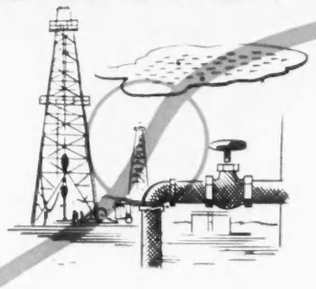

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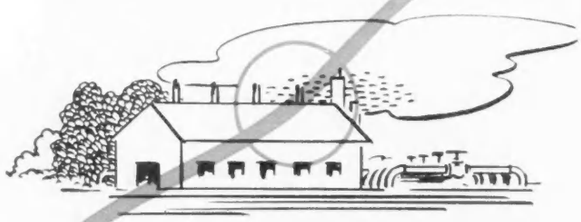

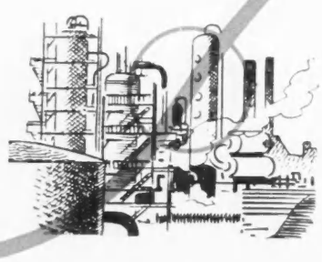

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TRINIDAD

TRINIDAD'S production during 1946 reflected the tendency of operators to cut back from the higher volumes of the past several years in order to conserve energy in the principal flowing fields. Output amounted to 859,967 barrels less than the 1945 total of 21,092,608 barrels. The 1946 production of 20,232,641 barrels includes a greater percentage of pumping production than last year, with a corresponding reduction in percentage of crude produced from flowing wells. During 1946 approximately 60 percent of the production was from flowing wells. Normally this has been about 75 percent.

With the addition of three rigs to the active list during the year, drilling volume was stepped up to some extent during the first part of the year, although later it slowed down, partly due to labor difficulties. Materials, a critical problem during 1945, were somewhat easier to obtain during 1946, although still not moving as freely as in most places outside the "sterling area." A rigid system of priorities is in effect to reduce purchases from the dollar pool as much as possible. Total drilling volume of 120 wells compares about the same as the last three war years, with footage drilled 531,458 feet, most of which was field development. This is only a little more than half of the nearly million feet drilled in 1940. Three exploratory wells were being drilled near the end of the year, and the outlook was for five or six rigs to be running strictly on wildcatting during 1947.

Of especial interest to most Trinidad operators is the prospect of extension of the producing trend into the Gulf of Paria off the west coast. Three seismograph crews were engaged in geophysical work offshore early in 1947, against the time when the government shall grant licenses for underwater tracts. These, although not let, are scheduled to come through the early part of the year. The companies plan to drill a deep wildcat off Point Fortin as a cooperative venture to obtain the first subsurface information, after which each will operate independently. It is hoped that the Cretaceous will be reached in the marine development. Interest is also being shown in deep prospecting in the producing fields, one well having recently gone below 11,000 feet at Peal, and it is understood to have found the Herrera sand faulted down to a depth 2000 feet below normal, and capable of producing 1000 barrels daily through a 6/64-inch choke. Another Cretaceous test during 1947 is planned for the Brighton area.

Refinery activity, in addition to processing the island's production in the two principal plants, includes the processing of approximately 300,000 barrels monthly from Venezuela and Colombia. This crude is brought in under bond for processing inasmuch as there is plant capacity over and above that needed for domestic production.

Producing Wells and Oil Production in Trinidad

FIELD	Year of Discovery	OIL WELLS AT END OF 1946: Producing: Flowing	Producing: Art. Lift	Producing: Total Producing	CRUDE OIL PRODUCTION (Barrels): Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
Forest Reserve	1913	127	213	340	13,700	5,335,672	5,003,800	78,935,835
Eyzabad	1920	74	180	254	8,500	3,210,450	3,103,500	91,453,894
Barrackpore-Penal	1913	19	82	101	5,195	1,990,600	1,904,975	17,337,266
Guayaguayare	1907	26	51	77	1,260	487,496	459,900	7,726,536
Cruse	1913	39	55	94	2,400	972,315	876,096	13,346,181
Coora-Quarry	1936	102	123	225	7,569	2,867,261	2,763,085	26,511,508
Morne Diable	1938	6	68	74	550	195,300	202,050	2,100,442
Point Fortin	1908	30	46	76	1,686	587,015	615,390	10,049,689
Guapo		146	178	324	11,260	4,345,200	4,110,950	63,085,488
Los Bajos	1928	6	40	46	533	210,160	195,545	3,264,167
Palo Seco	1929	37	127	164	1,500	575,824	547,500	22,899,111
Brighton	1910	17	28	45	1,230	425,310	448,950	5,713,979
Totals		629	1191	1820	55,383	21,092,603	20,232,941	342,424,096

Pipe Lines of Trinidad

COMPANY	Origin	Terminus	Length (Mi.)	Diameter Inches	Capacity Barrels Daily	Year Completed
Trinidad Leaseholds	Forest Reserve	Pointe-a-Pierre	16.4	12	43,600	1940
Trinidad Leaseholds	Forest Reserve	Pointe-a-Pierre	16.2	10	21,600	1928
Trinidad Leaseholds	Barrackpore	Phillipine	5.6	6	9,000	1921
TLL Siparia Trinidad	Morne Diablo	San Francique	5.7	4	8,600	1939
TLL Siparia Trinidad	Siparia	Forest Reserve	4.4	4	7,200	1931
TLL Trinidad Central	Cruse	Forest Reserve	4.2	6	7,200	1925
Trinidad Leaseholds	Guayaguayare	Barrackpore	21.8	6	8,600	1929
United British	Penal	Point Fortin	18.0	8		
United British	Quarry	Point Fortin	7.5	6		
United British	Coora-Morne Diablo	Los Bajos	5.0	2-4		
United British	Los Bajos	Point Fortin	8.0	6		
United British	Los Bajos	Point Fortin	8.0	4		
United British	Brighton-Guapo	Quarry	23.0	6		
*Trinidad Leaseholds	Forest Reserve	Pointe-a-Pierre	16.2	8	10 mln cu. ft. gas	1937

Trinidad Leaseholds operates lines from sea-loading jetty as follows: Two each of 16-inch and 12-inch, 7 of 8-inch, 1 of 6-inch, 2 of 3-inch and 1 of 2-inch.
* Gas line.

Data on Trinidad Refineries

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity Bbls. Daily	Type of Refinery	Operating Status
Trinidad Leaseholds, Ltd.	Pointe a Pierre	50,000	20,500	Complete	Operating
United British Oilfields	Point Fortin	40,000		Complete	Operating
Trinidad Central Oilfields	Tabaquite	500		Skim.	Shut Down
General Asphalt Company	Brighton	1,000		Skim.	Shut Down
Trinidad Oilfields Operating Company	La Brea	1,200		Skim.	Shut Down
Kern Trinidad Oilfields	Guapo	1,000		Skim.	Shut Down
Collie (Golden & Company	San Francique	500		Skim.	Shut Down
Total	7 Plants	94,200	20,500		

Engineering and Geological Data on Trinidad Oil Fields

FIELD	Proved Area (Acres)	Probable Ultimate Proved Area	Range of Gravity Oil (API)	PRODUCING FORMATION: Name	Kind	Age	Depths of Wells (Ft.): Minimum Top Pay	Maximum Total Depth	Type Structure
Forest Reserve	1200		14.8-33.2	Forest	Sand	Miocene	0	3500	Anticline
	1500			Cruse	Sand	Miocene	1500	8000	
Barrackpore	120	1500	17.3-30.6	Wilson	Sand	Miocene	500	3500	Faulted Anticline
Guayaguayare	110		15.3-49.9	Forest & Cruse	Sand	Miocene	0	5000	Fault trap.
Wilson	60		12.2-25.7	Wilson	Sand	Miocene		2500	Faulted Anticline
Cruse	250		13.2-30.5	Cruse	Sand	Miocene	1800	4000	Strat trap.
Palo Seco	100	2000	17.8-33.4	Forest & Cruse	Sand	Miocene	1500	5500	Strat. trap.
Morne Diablo	50		20-33.2	Cruse	Sand	Miocene	1000	4700	Fault trap.
Quinan	40		25.9-34.1	Cruse	Sand	Miocene	1000	4300	Fault trap.
Eyzabad	5100	6000	19-30	Forest & Cruse	Sand	Miocene	1500	6500	Anticline
Brighton	500	800	18	Forest	Sand	Miocene	700	3000	Anticline
Coora-Quarry	900	1400	25.9	Forest & Cruse	Sand	Miocene	1200	6500	Syncline
Guapo	3050	3400	16.8-24	Forest & Cruse	Sand	Miocene	1500	5700	Plunging nose
Los Bajos	400	500	27.5	Forest & Cruse	Sand	Miocene	1000	6000	Fold-Fault
Parrylands	3000				Sand	Miocene	100	1200	Anticline
Point Fortin	1300	1300	19.5	Forest & Cruse	Sand	Miocene	1500	7500	Overthrust on fault
Tabaquite			42	Tabaquite		Eocene	300	500	Thrust fault

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Fluorologs are compiled from fluorescent intensity measurements on drill hole cuttings samples mailed to our laboratory in conventional sample bags.

A geologic section over an oil and or gas accumulation is characterized by anomalously high fluorescent intensity. Hence, the presence or absence of oil or gas at greater depth is indicated by a fluorolog on the first two thousand, or less, feet of hole. This property of fluorologs is applied in deep wells and in core drill prospecting.

The fluorescent intensity of a drill hole section indicates the presence or absence of an accumulation located laterally and locally distant from the drill hole.

The fluorograph, the fluorographic recording instrument, is three hundred times as sensitive to fluorescence as is the human eye. Fluorologging detects and locates oil and gas shows in a drill hole. Fluorologs are especially desirable in geologic sections—such as limestone—which do not develop diagnostic resistivity curves.

The primary curve on a fluorolog is drawn on the fluorescent intensity (including mineral fluorescence) of the strata penetrated. This curve is used for correlation purposes, and in establishing correlation horizons within thick stratigraphic units not divisable by other means.

Fluorologs anticipate the presence or absence of a pay vertically ahead of the drill, reveal the presence of a laterally adjacent accumulation, detect, locate and evaluate local shows in a drill hole, and afford a correlation log based on the fluorescent intensity characteristic of the strata.

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ALBANIA, YUGOSLAVIA and GREECE

CRUDE oil production in Albania, Yugoslavia and Greece has been relatively small during the past two or three years. Actual production figures are not known but reports indicate that efforts now are being made to rehabilitate the old fields as well as explore for new areas. Of the three countries, Albania is the scene of some activity and the site of the most important oil producing area.

While oil production has been obtained elsewhere in Albania, the only production of consequence is in the Devoli district, consisting of five separate producing areas. The Devoli fields are located in the triangle formed by the union of the Devoli and Semeni rivers, a few miles north of the town of Berat. The district covers approximately 1730 acres and recoverable reserves at one time were estimated at 80 million barrels. Recent estimates of reserves in Albania have been placed around 25 million barrels.

The Devoli fields produce from the Upper Miocene formation between 1640 and 2620 feet. The oil is about 16-gravity (API).

In 1935, when oil was needed by the Italians for the Ethiopian War, Albanian crude oil output was only 41,000 barrels annually, but by 1939, under Italian development, the flow had been stepped up to 934,000 barrels. In 1942 production was reported to be 1,450,000 barrels, but in 1944 had dropped to 765,000 barrels. During the peak production period, Albania is reported to have had about 550 producing wells.

Oil produced at Devoli is transported through an 8-inch, 46-mile pipe line to the port of Valona. The government operates a small skimming plant at Berat.

All foreign companies and enterprises established in Albania before or during the Italian occupation have been taken over by the Albanian government and placed under the administration of a special commission. These properties included the Italian sponsored Agenzia Italiana Petroli Albania, a subsidiary of the Italian AGIP group. The prospecting rights held by AGIP in Albania covered approximately 2,980,000 acres.

Under an economic pact with Yugoslavia, the Albanian government oil organization has already begun to export various petroleum products to Yugoslavia. Under this pact, companies will be formed combining Yugoslav and Albanian capital and after 30 years Albania will be entitled to buy the shares held by Yugoslavia. The main object of the formation of new companies in Albania will be to increase the present reported output of about 500 barrels to 1000 barrels daily.

Yugoslavia

Petroleum activities in Yugoslavia are now naturalized, with the effect on private interests still obscure.

Before the war the principal private firms that had participated in petroleum exploration activities included Standard Oil Company (New Jersey), which operated through Yugoslav Petroleum Exploration Company and the Pannonia and Medjumursko Petrolejsko Companies. Shell and Standard-Vacuum interests operated refining plants at Sisak and Bosnanska Brod on the Save which had an aggregate throughput capacity of 1.4 million barrels annually.

No figures have been released for current Yugoslavia oil production but it is reported that drilling is in progress in the Medjumurje region of northwestern sector of the country.

Before the war Yugoslav production of oil was small, the only field being in the Peklenco-Selencia district, northeast of Zagreb, near the Austria-Hungary border. This area was discovered during the German occupation with production reaching more than 600 barrels daily from about six wells. The wells reportedly produce from the Devonian formation around 4000-4200 feet. It is possible that this oil district is much larger than indicated and that the Peklenco-Selencia discovery has opened new possibilities for oil exploration in Yugoslavia. There are reports that shows of asphalt have been located near the cost and will be exploited.

During the early development of the Peklenco field by Medjumursko Petrolejsko, total production from shallow wells between 200 and 260 feet was about 600 barrels monthly. The oil of Selencia is paraffinic with a gravity of 39-degrees (API), and a gasoline content of 24 percent. The crude of Peklenco, however, is asphaltic, being 18 to 21-gravity (API) and yields no gasoline by ordinary distillation.

In October, 1940, the Medjumursko Petrolejsko passed into the hands of the Azienda Generale Italiana Petroli (AGIP).

Natural gas is produced in the Bujavica-Kutina region, about 60 miles east of Zagreb. Reports say that 1944 production totaled about 229,560,500 cubic feet. This peak production was reached during German occupation. A pipe line was built in 1939-40 from Kutina to Zagreb. There also is a carbon black plant located at Kutina burning the methane gas.

Besides Standard-Vacuum and Shell refineries, Yugoslavia has three other plants, including one at Fiume. Small plants are located at Smederevo and Osijek.

Greece

The only area in Greece known to produce crude oil is the Zante field on the southwest coast of the Island of Zante in Keri Parish. Existence of petroleum at Zante was known to the ancient Greeks and was first mentioned by Herodotus in 484 B. C. First research work started in 1866 and various companies have at times undertaken to drill to shallow depths. In this early development 10 tests reached depths averaging about 46 feet. The maximum depth reached in any of these early tests was about 115 feet.

Various layers of heavy crude oil were found between the surface and the maximum depth reached, in both the Pliocene and Miocene strata. Modern drilling began in 1927 and renewed in 1933 when the Greek government granted a concession to D. Kolaitis. This drilling resulted in the discovery of oil in the Keri area.

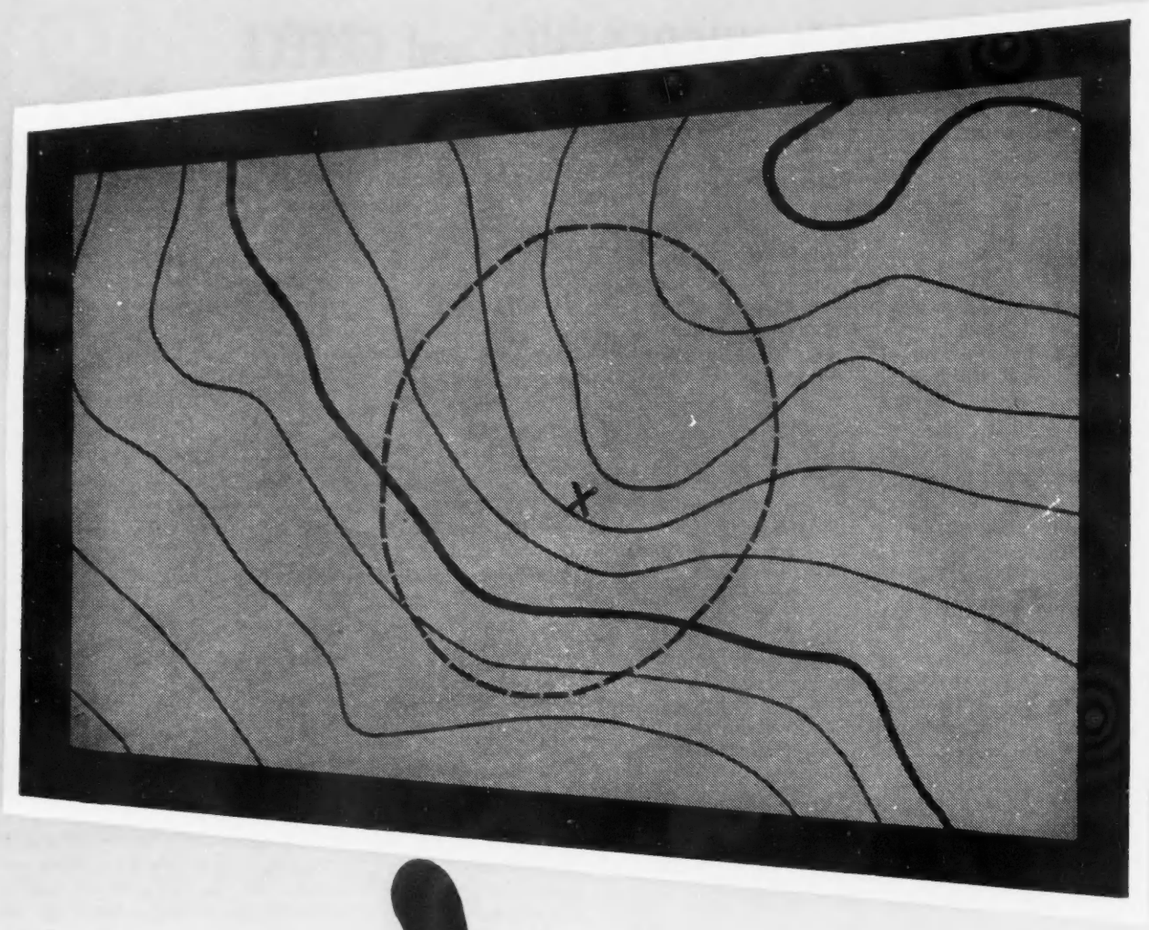
Producing formations include dolomite, clay, sand, shale and gypsum. The deepest hole drilled was to 260 feet in gravel sand. The peak annual production did not exceed 3500 barrels. All work in the Zante district was halted in 1939.

Exploration work on the mainland of Greece was started shortly before the war by U. S. interests but was abandoned with the equipment taken by the Italians and Germans.

The Greek government has decreed that oil is a national product and the oil industry is reported nationalized.

Refineries of Albania and Yugoslavia

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
Albania:					
Albanian Government	Berat	750	None	Skimming	Operating
Yugoslavia:					
Ivanovic & Company	Osijek	550	None	Skimming	Operating
Raffineria di Oli Minerali (A.G.I.P.)	Fiume	2,300	None	Skim-Lube-Wax	Rebuilding
Shell Oil Co. of Jugoslavia, Ltd.	Sisak	2,000	None	Skimming	Operating
Standard-Vacuum Oil of Yugoslavia, Inc.	Brod	2,250	None	Lube-Wax	Operating
Sumadiska Kreditava	Smederevo	1,000	None	Skimming	
Totals	6 Plants	8,850			



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AUSTRIA

AUSTRIA'S crude oil production in 1946 showed a sharp increase over the previous year. The 1946 output is estimated at 5,636,363 barrels as compared with 3,069,745 barrels in 1945. However, the flow was considerably under the peak year of 1944 when 8,218,436 barrels are reported to have been produced.

All of the Austrian production and all of the Austrian refineries, with one exception, are located in the Soviet Russia occupation zone. In this zone is located between 60 and 70 percent of the entire Austrian economy. Under Russian interpretation of the Potsdam Agreement, all German assets within their area of occupation became Soviet property and since the time of their occupation they have physically seized and have assumed complete and direct control of all such properties. British and American oil investments in Austria are reported to exceed $100 million.

American and British private interests, supported by their respective governments, have filed formal claims for the restitution of the properties forcefully taken from them by the Germans and now operated by the Russians.

All production, currently estimated at 474,320 barrels monthly, is sold to the Soviet Mineral Oil Administration at the fields. The SMOA, in accordance with predetermined programs made solely by them, allot this crude to the refineries, to which it arrives both by tank cars and by an Anglo-American 12-inch pipe line, owned jointly by Socony-Vacuum and Shell, from the fields to Vienna.

In view of the degree of control exercised by the Russians, none of the British or American interests have brought in any new equipment whatever since the liberation nor have the Russians imported any drilling equipment for those areas which they have physically seized. It is reported that recently the Russians have started drilling three or four tests in their seized fields. American and British interests have not attempted to drill any wells since the liberation on their properties because their stocks of tubing and casing were seized by the Russians and have not been returned.

Because of the excessive production demanded by the Russians, the water content has already increased to about 50 percent on the average of the gross fluid since the resumption of production following the liberation. All efforts to counteract this water increase failed because of Russian resistance. Excessive gas-oil ratios are also reported.

The oil fields of Austria lie in the Vienna Basin extending from Central Moravia in Czechslovakia to the south of the Danube and east of Vienna.

The major field at Zistersdorf was discovered in 1932 and has rapidly increased production since that time. Production comes from sand horizons in the Sarmatian and also in the Flysch. The Zistersdorf field proper produced an estimated 968,709 barrels during 1946.

The largest of Austria's oil fields is the Hauskirchen-St. Ulrich-Van Sickle area. During 1946 this area produced approximately 2,600,000 barrels of oil. The Gaiselberg field is the second largest producer with an output of 983,679 barrels in 1946.

Several wells were reported drilling during 1946 in Burgenland Province, in the Lake Neusiedl area east of Graz. This area is situated about half way between the Zistersdorf fields and the Hungarian oil fields at Lispe.

Austria's Annual Crude Oil Output by Fields

FIELD	Prior to 1942	1942	1943	1944	1945	1946
Muhlberg		2,198	88,316	334,234	122,876	732,711
Hauskirchen-St. Ulrich	538,905	1,604,835	3,468,428	4,297,351	1,360,445	2,377,116
Maustrenk	1,401	3,635	168,913	294,668	140,453	273,066
Van Sickle	1,926,463	1,001,716	633,943	560,723	127,843	297,311
Neusiedl	124,420	12,394	6,440			
Zistersdorf	3,782,150	1,519,248	1,456,747	1,254,714	546,132	968,709
Gaiselberg	2,365,936	1,735,360	1,650,713	1,462,444	763,469	983,679
Hohenruppersdorf	468	820	250	11,504	5,150	
Aderklaa		24	1,536	2,798	4,337	3,771
Totals	8,739,443	5,880,230	7,475,286	8,218,436	3,069,745	5,636,363

Data on Austrian Refineries

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
Aktiengesellschaft der Shell Floridsdorfer-Mineraloelfabrik (Shell)	Floridsdorf (Vienna)	2,000	750	Skim-Crk.	Operating
Creditul Minier	Kronenburg (Vienna)	1,000	None	Skim.	Operating
Donau-Oel-Tank-Lager G.M.B.H.	Moosbierbaum (Vienna)	2,250	None		Shut down
Elwerath-Wintershall I. G. Farbenindustrie groups (Socony-Vacuum and Shell Group)	Lobau (Vienna)	4,000	None		Shut down
Nova Oel- und Brennstoffgesellschaft A.G.	Schwechat (Vienna)	2,000	None	Skim.	Shut down
Oesterreichische Fanto A. G.	Vossendorf (Vienna)	1,000	None		Shut down
Vacuum Oil Company, A. G. (Socony-Vacuum)	Kagran (Vienna)	2,000	None	Skim.	Operating
Max Hümer	Braunau	100	None		Operating
Total	8 Plants	14,350	750		

Engineering and Geological Data Oil Fields of Austria

FIELD	Est. Proved Area Acres	Gravity of Oil API	PRODUCING FORMATION Local Name	Kind	Geologic Age	Depth of Wells Ft. Minimum Top Pay	Depth of Wells Ft. Maximum Total Depth	Avg. Thickness of Pay Ft.	Type Structure
Aderklaa	n.a.	Gas	Schlier	Sand	Miocene	n.a.	8150	n.a.	Dome.
Alt. Lichtenwarth	n.a.	Gas	Sarmat-Torton	Sand	Miocene	n.a.	3100	n.a.	Fault.
Gaiselberg	200	26-28	Sarmat	Sand	Miocene	3561	4427	35	Fault.
Hohenruppersdorf	n.a.	n.a.	Torton-Flysch	Sand	Miocene-Cretaceous	n.a.	4794	40	Fault.
Maustrenk	200	n.a.	Schlier-Flysch	Sand	Miocene-Cretaceous	2785	n.a.	20	Semi-Dome
Muhlberg	n.a.	n.a.	Pannon-Sarmat-Torton	Sand	Pliocene-Miocene	n.a.	n.a.	n.a.	Dome.
Neusiedl	n.a.	31	Flysch	Sand	Cretaceous	3348	4243	n.a.	Fault.
Plattwald	n.a.	n.a.	Sarmat	Sand	Miocene	n.a.	n.a.	n.a.	Dome.
Scharfeneck	n.a.	n.a.	Schlier	Sand	Miocene	n.a.	n.a.	n.a.	Fault.
St. Ulrich-Hauskirchen-Van Sickle	2000	33	Schlier-Flysch	Sand	Miocene-Cretaceous	3095	3295	n.a.	Dome.
Zistersdorf	100	19-34	Sarmat-Flysch	Sand	Miocene-Cretaceous	2788	4828	25	Fault.

n.a. denotes data not available

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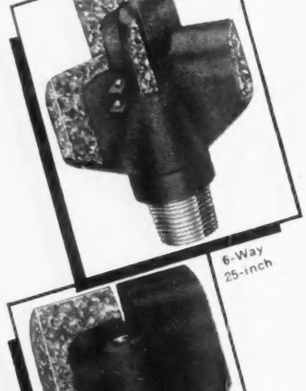

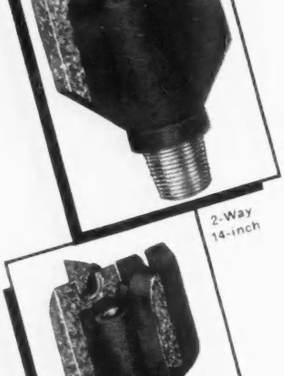

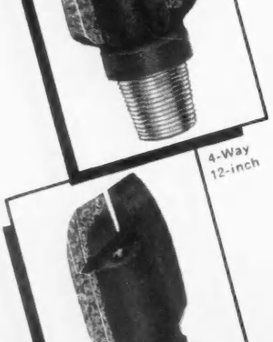

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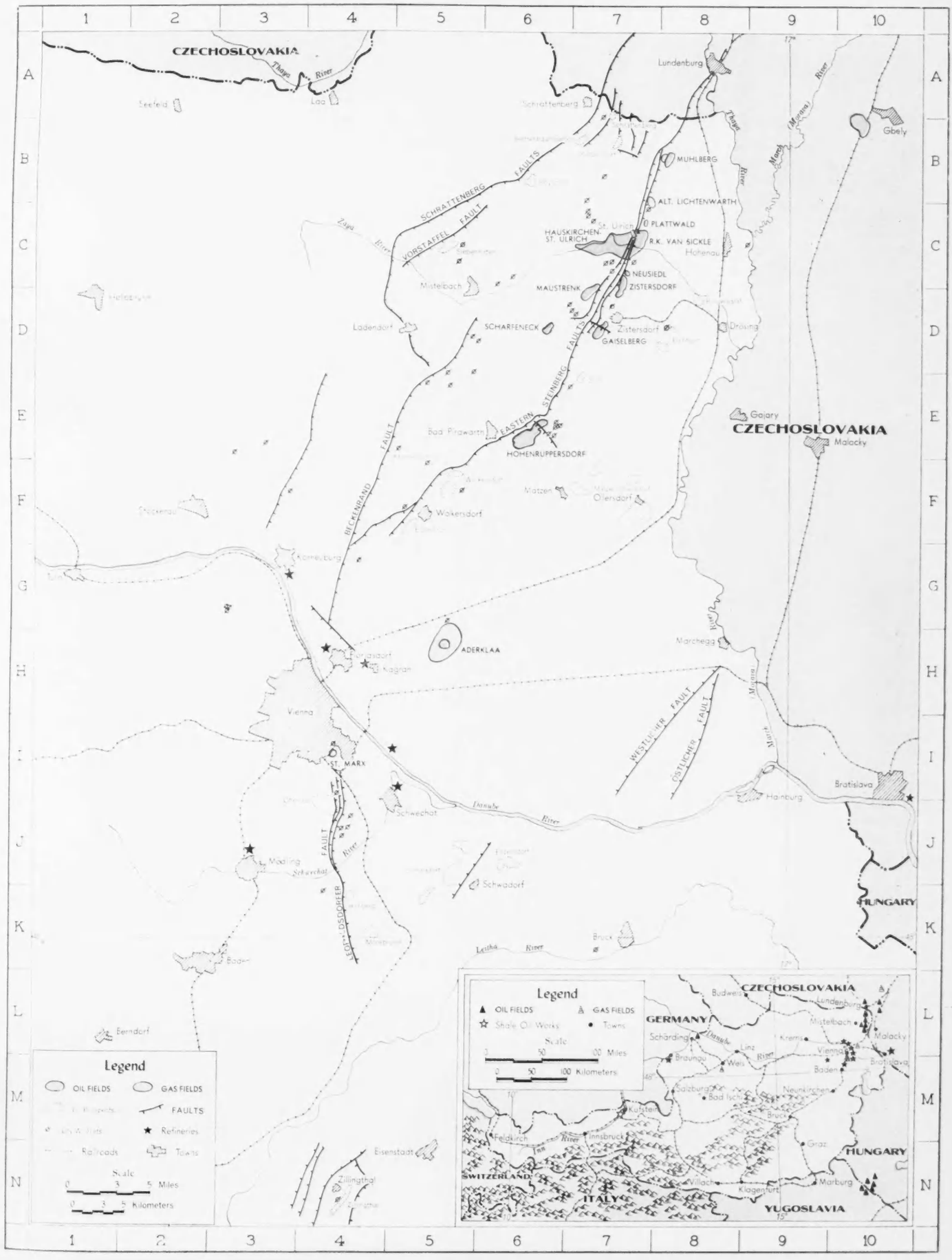
AUSTRIA—Vienna Basin Fields



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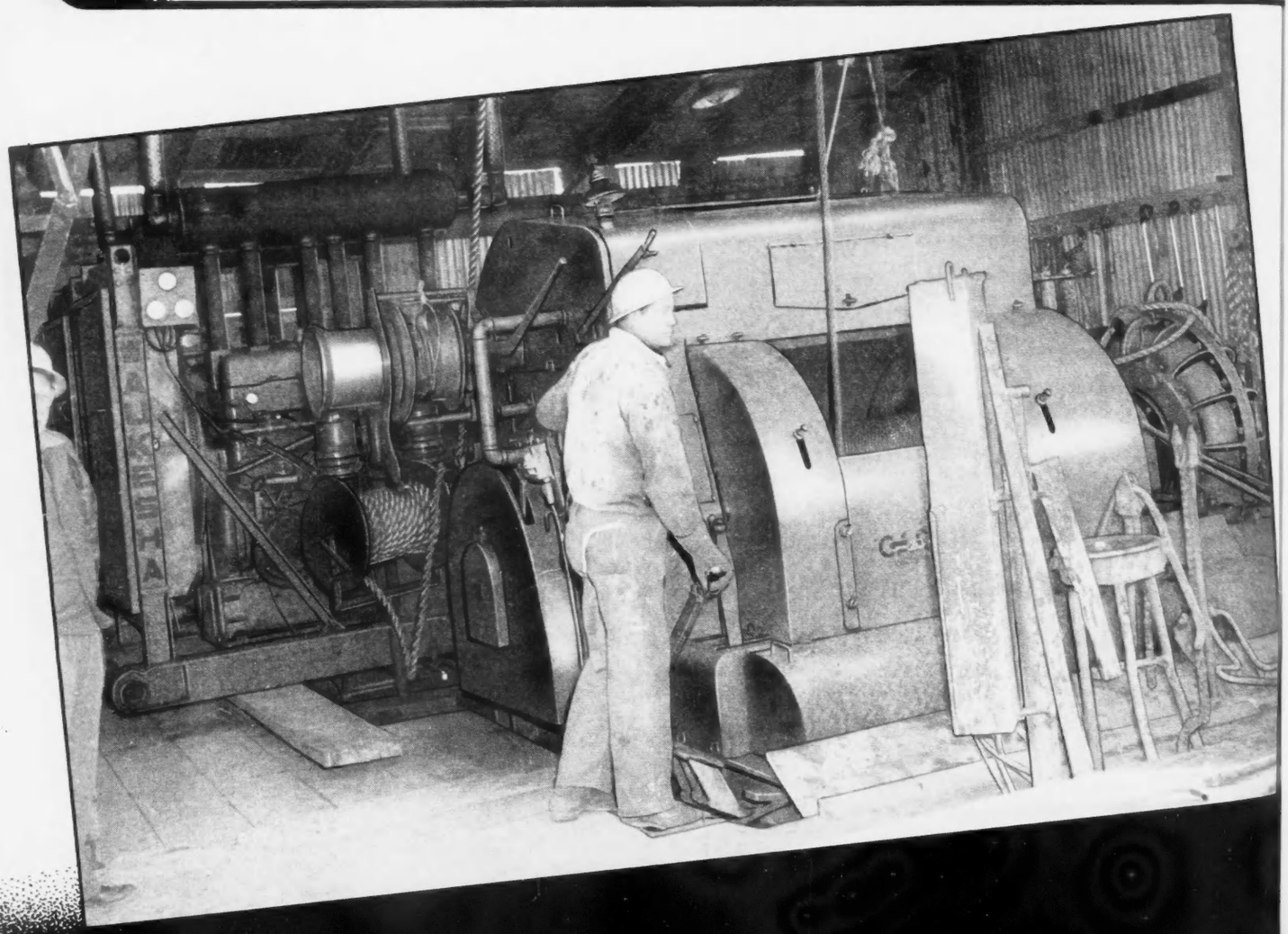

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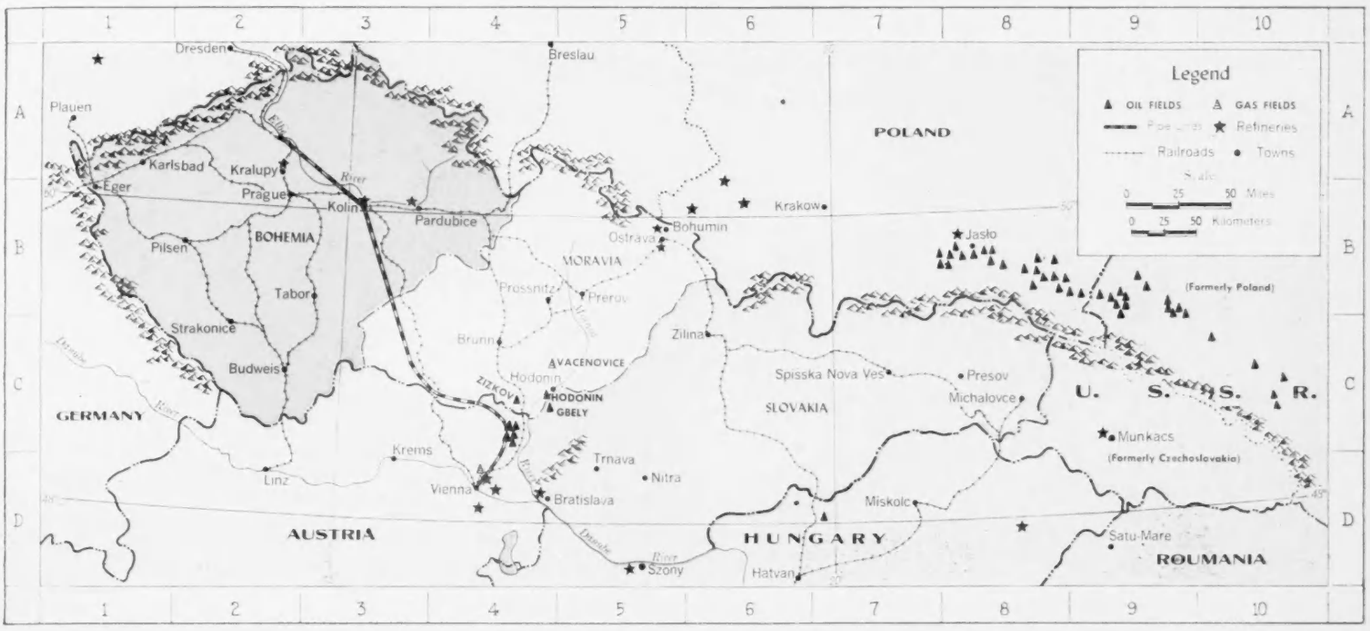


A TWO-YEAR Plan calling for the production of about 1,354,000 barrels of oil annually, has been adopted by the Czechoslovak Parliament and as a result Czechoslovakia is experiencing considerable activity.

Production during 1946 is estimated at 203,100 barrels or about 15 percent of the annual production goal under the Two-Year Plan.

The first result of the expanded activity apparently is the discovery of a new productive area at Gross-Bilowitz, near Breclav (Lundenburg) on the frontier of Moravia and Lower Austria. Miocene production is reported to have been obtained at 3500 feet with the discovery well having an initial flow of 50 barrels daily. The strike is of particular interest because of its geographical proximity to Zizterdorf and the Austrian gas wells on the Zaya River. It may show that the Austrian oil deposits are continued into Southern Moravia.

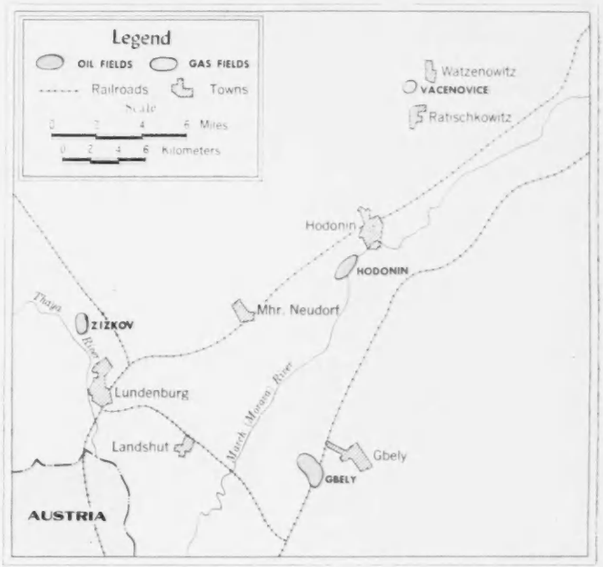
Limited oil production has been obtained for a number of years from several small fields in South Moravia, West Slovakia and East Slovakia. Geographically, these areas are embayments of Neogene deposits which locally lie between the Bohemian massif and the Carpathian mountain range, forming extensions of the great Vienna basin.

In Western Slovakia the producing field is Gbely, under exploitation since 1913. Oil comes from shallow sand reservoirs (mostly lenses) of Sarmatian (Miocene) age on a locally faulted structural undulation. The average thickness of the pay horizon is about 100 feet, and it is usually found between 550 and 800 feet. In South Moravia there is located the Hodonin field which was discovered in 1919. The structure and stratigraphy are similar to those at Gbely, shallow oil being produced from about the same level and also from deeper sands around 3000 feet.

In Western Slovakia two drilling crews are at work and tests are being drilled at Sekule, Malacky and Bersky Svaty Jan. About $400,000 have been allotted for exploratory drilling in this region during 1947. In Southern Moravia there is also considerable exploration work and about $1 million have been allotted from the profits of the synthetic oil works at Brux for development in this area. Russian petroleum experts are believed assisting in the exploration work.

Natural gas is being produced from a number of wells in the Ostrava district on an increasing scale. This gas contains 90 to 95 percent of methane, and is very valuable for motor fuel production.

Moravia Oil and Gas Fields



Data on Czechoslovakian Refineries

COMPANY	Location of Plant	Total Crude Charging Capacity (Bbls. Daily)	Operating Status
Apollo Company	Bratislava	1000	Operating
Fanto Works	Pardubice	1350	Operating
	Bogamin	400	Destroyed
Government	Dubowa	600	Destroyed
Lesier-Benzol Verband	Kralupy	400	Shut Down
Privozar Minerali (Privos)	M. Ostrava	340	Operating
Vacuum Oil Company, S. A. (Socony-Vacuum)	Kolin	600	Operating
Total	7 Plants	4690	

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FRANCE

FRANCE'S crude oil production, which comes mainly from the Pechelbronn field in the Department of Bas-Rhin, in 1946 amounted to 233,238 barrels, slightly more than 100 percent over the 112,731 barrels produced in 1945. Responible for this boost was rapid rehabilitation at Pechelbronn.

This field produced 231,294 barrels in 1946 against 105,644 barrels in 1946 and at the end of the year there were 707 wells on production. During 1945 eight wells were completed, four being oil producers and the other four dry holes. Total footage drilled was 16,044 feet. Drilling was boosted considerably in 1946 when 31 wells were completed with total footage of 60,436 feet. Of the completions, 21 were oil producers and 10 were failures.

The Pechelbronn field, located about 19 miles north of Strasbourg, is operated by Pechelbronn Societe Anonyme d'Exploitations Minieres. The area has been exploited for more than two centuries. The first concession dates from as far back as 1735, and has been developed by the underground mining of oil bearing sands, as well as producing the oil seeping into the galleries.

Previous to the second world war, Pechelbronn oil output was steady and amounted to about 490,000 barrels annually; 280,000 barrels of which was produced from the wells and the remaining 210,000 barrels from sumps and galleries, a method which is peculiar to the Pechelbronn area.

The war halted the company's activities in the area but the operator resumed operations at the end of 1944. Since that time, continuous efforts have been devoted to reconstruction work, in view of the heavy damage suffered by drilling and refinery equipment. These efforts have been successful in spite of the difficult conditions caused by the war. By the end of 1946, the total monthly output had exceeded 28,000 barrels which is about 70 percent of the prewar production.

There are three French government-controlled oil companies exploring for oil in the south of France. Results to date are one gas-oil field at Saint Marcet, Haute Garonne Department, with indications favorable for a second gas field

Data on French Refineries

COMPANY	Location of Plant	Crude Charging Capacity, (Bbls. Dai'y)	Cracking Capacity, (Bbls. Daily)	Type of Refinery	Operating Status
Brest Port Petrolier (Sub. Pechelbronn Soc. Anon.)	Brest	2,000	None	Skim	Not known
Compagnie des Produits Chimiques et Raffineries de Berre	Berre (Marseille)	10,000	4,500	Complete	Operating
Compagnie Francaise de Raffinage	Martigues (Marseille)	22,000	5,900	Skim-Crk	Operating
	Gonfreville (La Harve)	36,000	8,800	Complete	Partially Operating
Compagnie Industrielle des Petroles, S.A.F. (Socony-Vacuum)	Sete (Frontignan)	9,500	3,500	Complete	Operating
Les Propetrol Consommateurs de Petrole (Aff. French Railroads	Donges (St. Nazaire)	3,500	None	Skim	Damaged, shutdown
Pechelbronn-Quest, Soc. Anon.	Donges (St. Nazaire)	5,000	None	Skim	Shutdown
Raffineries de le Vacuum Oil Co. S.A.F. (Socony-Vacuum)	Gravenchon (Rouen)	6,000	3,500	Lube-Wax-Asphalt	Operating
Raffineries de la Vacuum Oil Co. S.A.F. (Socony-Vacuum)	Port Jerome (Le Harve)	6,500	2,300	Compounding	Damaged
Raffinerie de Petrole du Nord	Dunkerque	10,000	2,000	Skim-Crk	Destroyed
Societe Anon. des Petrole Jupiter (Shell)	Pauillac (Bordeaux)	10,000	7,000	Skim-Crk	Damaged, shutdown
Societe Anon. des Petrole Jupiter (Shell)	Couronne Rouen)	15,000	7,000	Skim-Crk	Partially operating
Societe de Raffinage des Huiles de Petrole (Anglo-Iranian)	L'Avera (Marseille)	11,000	3,000	Skim-Crk	Operating
	Courcheletts	5,200	2,000	Lube-Wax-Asphalt	Rebuilding
Societe des Raffineries de Petrole de la Gironde (Texas)	Bec D'Ambes (Bordeaux)	7,000	3,000	Skim-Crk	Damaged, shutdown
Standard Francaise des Petroles, S.A. (Standard Jersey, Atlantic & Gulf)	Port Jerome (Le Harve)	25,000	12,000	S.C.L.A.	Rebuilding, partially operating
Pechelbronn Societe Anon. d'Exploitations Minieres	Merkwiller (Pechelbronn)	1,500	None	Skim	Shut down
Total	17 Plants	185,000	64,500		

Producing Wells and Production of France

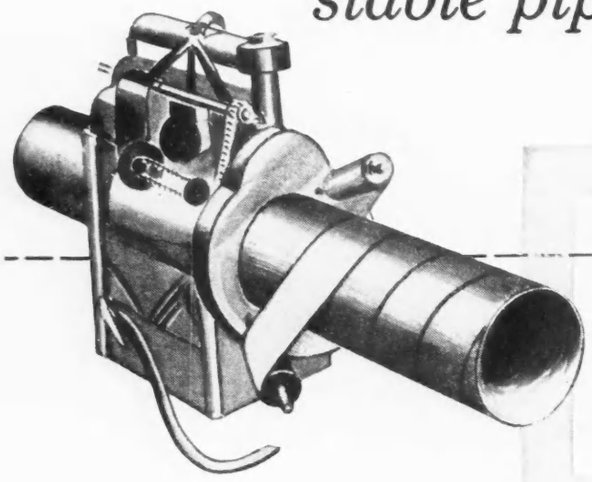
DEPARTMENT AND FIELD	Operating Company	Year of Discovery	OIL WELLS AT END OF 1946				CRUDE OIL PRODUCTION (Barrels)			
			Producing							
			Shut In	Flowing	Art. Lift	Total Producing	Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
Haute Garonne:										
St. Marcet:										
Oil Area	Regie Autonome des Petroles	1939	1					5,770	930	18,100
Gas Area[1]			2	5		5	14,000	3,000	3,880	12,970,000
Herault:										
Gabian	Societe Nationale des Petroles du Languedoc Mediteraneen	1924			7	7	10	1,317	1,014	
Bas-Rhin:										
Pechelbronn	Pechelbronn Societe Anonyme d'Exploitations Minieres	1882			707	707	950	105,644	231,294	13,225,227
Totals (Oil Only)			1		714	714	960	112,731	233,238	13,243,327

[1] Production given in million cubic feet.

Drilling in France

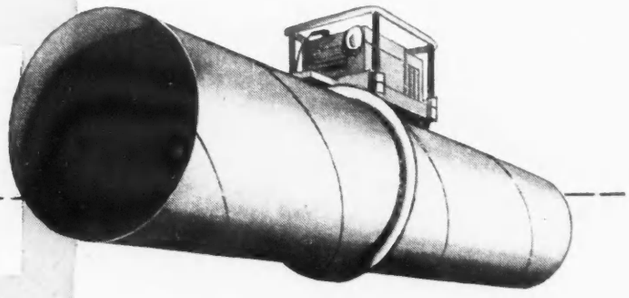
DEPARTMENT AND FIELD	Operating Company	WELLS COMPLETED IN 1945					WELLS COMPLETED IN 1946					Wells Drilling and Shut Down at End of 1946		
		Oil	Gas	Dry	Total Wells	Total Footage	Oil	Gas	Dry	Total Wells	Total Footage	Dr	SD	Total
Herault:														
Gabian	Societe Nationale des Petroles du Languedoc Mediteraneen	...	...	2	2	1,557	...	...	2	2	1,957	6	...	6
Wildcats														
Haute Garonne:														
St. Marcet	Regie Autonome des Petroles	2	8	3	13	84,295	2	9	3	14	90,760	1	14	15
Wildcats		0	0	1	1	9,658	-	1	1	2	11,650	5	2	7
Bas-Rhin:														
Pechelbronn	Pechelbronn Societe Anonyme d'Exploitations Minieres	4	...	4	8	16,044	21		10	31	60,436	20	...	20
Aquitaine Basin:														
Wildcats	Societe Nationale des Petroles d'Aquitaine	...	...	2	2	5,126			4	4	16,610	5	4	9
Totals		6	8	12	26	106,680	23	10	20	53	181,413	37	20	57

The economics of cathodic protection require the use of stable pipe protection



plus modern methods of application

and electrical inspection



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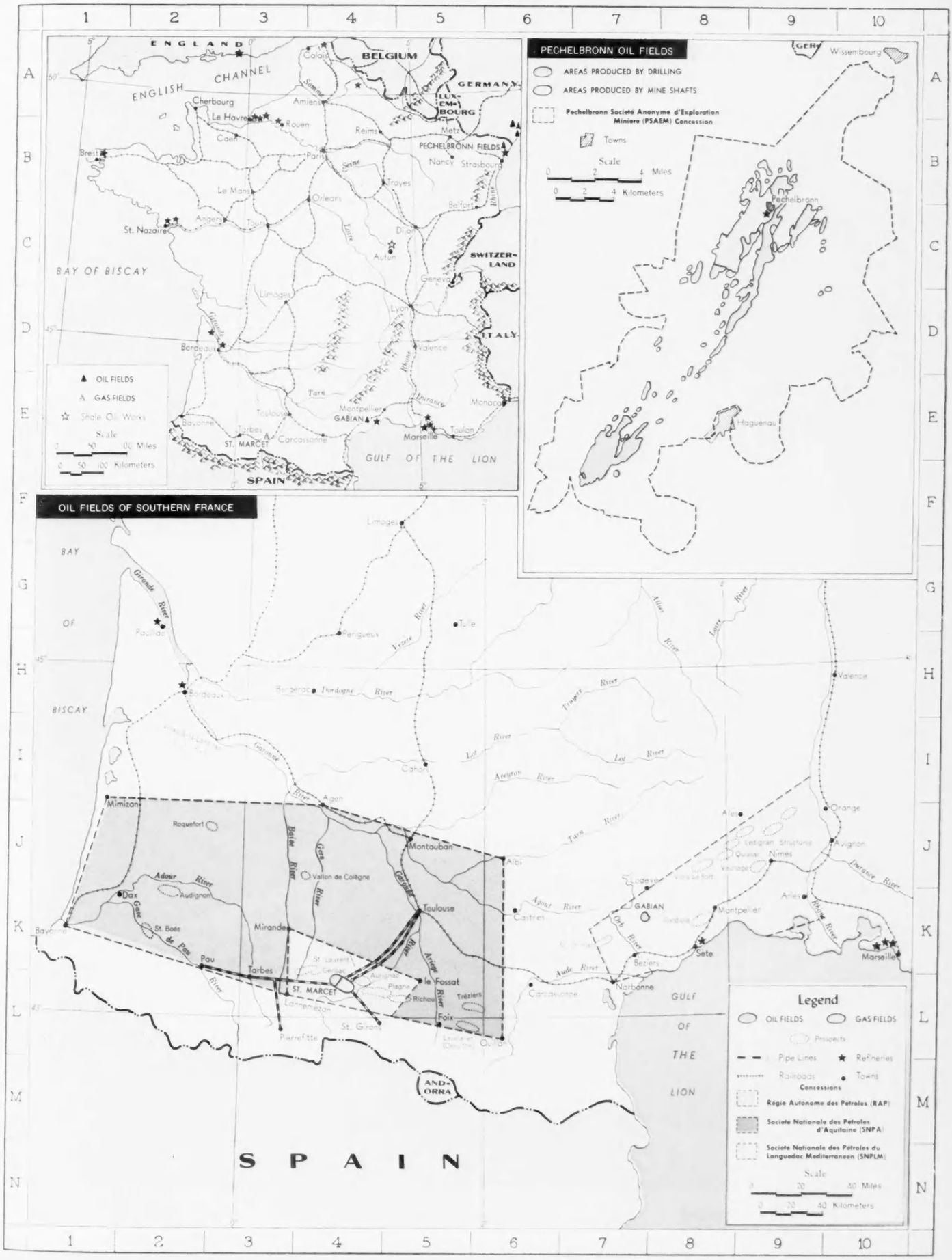
FRANCE—Fields and Concessions



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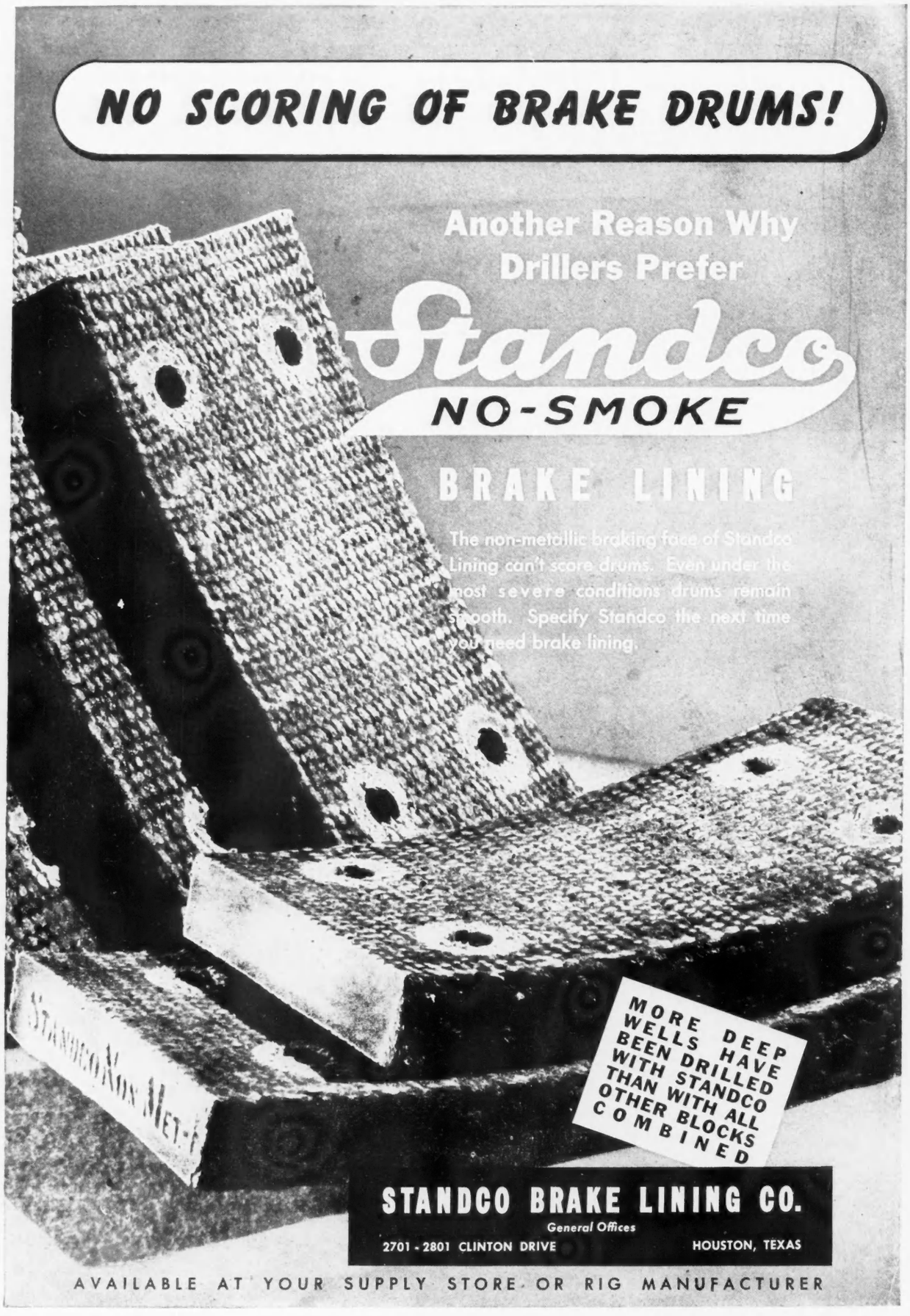

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on the Proupiary structure, east of St. Marcet on a continuation of the same line of folding as St. Marcet.

A small amount of oil is being pumped from the St. Marcet No. 11, which encountered a dolomite lime of Jurassic age at about 6000 feet and faulted upward on the southern flank of the structure. Using gas lift, it produces 20 barrels daily.

The operating company at St. Marcet is Regie Autonome des Petroles. In 1946, the field produced 930 barrels of oil and 3880 million cubic feet of gas from five flowing gas wells. Drilling by RAP in 1946 included the completion of two oil wells, 10 gas wells, and four dry holes. Total footage drilled was 102,410 feet. At the end of the year, the company had six rigs active, five being on wildcat locations.

Wildcats Completed in France in 1945 and 1946

DEPARTMENT	Company and Well	Date Completed	Total Depth (Feet)	Results
Herault	Languedoc Mediterraneen's St. Chinian 3	10-45	945	Dry
Herault	Languedoc Mediterraneen's St. Chinian 4	3-46	855	Dry
Herault	Languedoc Mediterraneen's Creissan 1	6-46	1100	Dry
Haute Garonne	Regie Autonome's Proupiary 1	1946	7550	Completed as gas well
Haute Garonne	Regie Autonome's Plagne 2	1946	4100	Dry
Haute Garonne	Regie Autonome's Aurignac 1	1945	9658	Dry
Ariege	d'Aquitaine's Treziers 1	12-45	3520	Dry
Ariege	d'Aquitaine's Enganly D-2	4-46	6240	Dry
Ariege	d'Aquitaine's Lagarde T-2	12-46	5425	Testing formation
Gers	d'Aquitaine's Borderes B-2	2-46	1650	Geological test
Landes	d'Aquitaine's Donzacq 1	9-45	1613	Geological test
Landes	d'Aquitaine's Louer L-1	8-46	3290	Dry

Gasoline in the St. Marcet field is being extracted by absorption. Contract has been let to a United States company for a modern gasoline plant to handle 40 million cubic feet of gas daily.

Societe Nationale des Petroles d'Aquitaine holds the largest concessions in southern France. The area comprises about 5,928,000 acres, extending from the Toulouse area to the Atlantic Ocean.

This company, besides undertaking a considerable amount of geophysical and geological exploration work to map existing structures, has several wildcat operations under way. In 1946, the firm completed four dry holes with a total footage of 16,610 feet. During the year the firm purchased drilling equipment amounting to $1,350,000 in the United States.

Societe Nationale des Petroles du Languedoc Mediterranean owns a concession of approximately 1,976,000 acres in the south of France, centered around Montpellier. The company operates the Gabian field, Department of Herault, which was discovered in 1924. Present production is only 10 barrels daily. In 1946, the company completed two dry wildcat tests with a total footage of 1957 feet. At the end of the year it had six rigs active on wildcat locations.

The Gabian field is a small anticline in the Muschelkalk (Triassic), being highly faulted and complicated.

The cooperation of E. D. Lynton, Institut du Petrole, and Direction des Carburants is gratefully acknowledged.

Engineering and Geological Data on French Oil Fields

DEPARTMENT AND FIELD	Est. Proved Area (Acres)	Gravity of Oil (API)	PRODUCING FORMATION			Depth of Wells (Ft.)		Type Structure
			Local Name	Kind	Geologic Age	Minimum Top Pay	Maximum Depth Wells	
Herault:								
Gabian	17	34	Muschelkalk	Dolomite	Lower Triassic	205	1200	Faulted Anticline
Haute Garonne:								
St. Marcet		31	Cenomanian	Lime	Cretaceous	4920	6000	Anticline
Bas-Rhin:								
			U. Pechelbronn	Sand	Oligocene	660	990	
			L. Pechelbronn	Sand	Oligocene	660	1155	
Pechelbronn	7660	27		Dolomite	Oligocene	825	1650	Anticline
				Sand	Jurassic	1320	2310	
				Sand	Triassic	2970	3960	

THE NETHERLANDS

THE only oil discovered so far in The Netherlands comes from the small Schoonebeek field, near Coevorden, on the German frontier.

Bataafsche Petroleum Maatschappij (Royal Dutch-Shell) started its oil search in The Netherlands in 1933 shortly after the search began in Northern Germany. Upon the German invasion of The Netherlands in 1940, BPM was forced to continue this work, but as a result of effective sabotage it was not until February, 1943, that oil was found east of the small town of Coevorden and at the end of that year a production of only seven barrels a day was reached. After collapse of Germany in 1944, the work came to a complete standstill and it could only be resumed following liberation.

The Schoonebeek field presently covers a proven area of about 1000 acres. The production is from the Valanginian sand of the Lower Cretaceous Age between 2500 and 2650 feet. The gravity of the oil is 28-degrees (API). The structure is defined as an anticline with the average thickness of the pay sand being 80 feet.

During 1946, BPM completed 19 wells in the area, 17 of which were oil producers and two were dry holes. Total footage drilled was 48,894 feet. At the end of the year one rig was active.

The field had 13 wells on artificial lift at the end of the year and 10 were shutin. Production at the end of 1946 was 2350 barrels daily. Total production during 1946 was 435,420 barrels as compared with 40,676 barrels in 1945.

The subsurface geology of the western and northwestern part of The Netherlands appears to be sufficiently favorable for the accumulation of oil to warrant a thorough search for new deposits. Unconsolidated deposits of sand, clay, graven and peat, chiefly Pleistocene age, conceal bedrock through all of The Netherlands except for small exposures of Tertiary and mesozoic strata that appear near the German border in the eastern part of the provinces of Overijssel and Gelderland and in the southern sector of the Limburg panhandle. This cover of unconsolidated sediments increases to the northwest and is 1000 feet thick in central and western Holland.

Bataafsche Petroleum Maatschappij operate a skimming-asphalt-cracking plant at Rotterdam (Pernis). This plant has a capacity of 14,000 barrels daily and an additional cracking capacity of 12,500 barrels daily.

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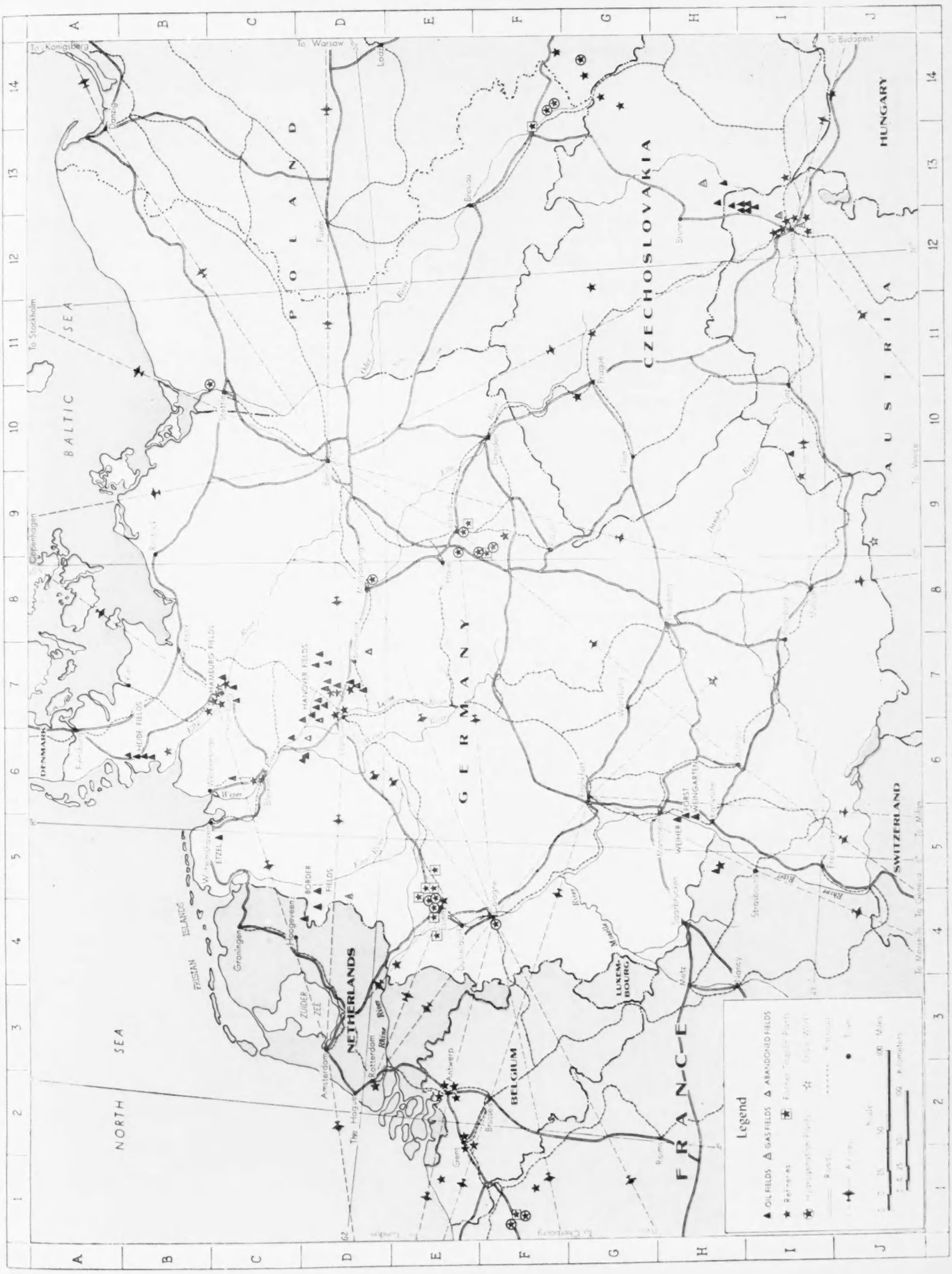
GERMANY and THE NETHERLANDS



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GERMANY

STILL faced with shortages of drilling equipment, housing and labor, German oil production, nevertheless, showed a slight gain during 1946. Total output is estimated at 4,634,000 barrels as compared with an estimated 3,771,000 barrels in 1945.

An increased effort is reflected in the boost in number of rigs active. During the first quarters of 1946, 51 wells were reported completed, including 30 oil producers in proven fields, one gas well, and 20 dry holes. The failures include 15 field wells and five wildcat ventures. At the end of the first quarter of 1946, 35 rigs were active and 32 other rigs were shut down. Active rigs included 10 wildcat tests and 25 field wells. Wildcat drilling was centered on the testing of more salt domes in North Germany.

Almost all the crude oil production in Germany is located in the British zone of occupation. The American zone of occupation accounted for only about 35,000 barrels of oil during 1946. The American fields are located in the Rhine Valley graben region. The British zone covers the salt dome producing region of North Germany. Also, most of the crude oil refining plants operating are situated in the British zone.

The most prolific producing area in Germany during 1946 was the Nienhagen-Eichligen field in the Hanover district. This area produced an estimated 1,099,000 barrels last year.

Refineries Operating in Germany

COMPANY	Location of Plant	Crude Charging Capacity Bbls. Daily	Output Jan.-June 1946
Deurag and Merag	Hanover (Misburg)	6,000	1,036,126
Deutsche Vacuum	Oslebhausen (Bremen)	2,200	388,976
Hemmingstedt	Molme	1,500	222,901
Deutsche Gasolin	Dollbergen (Hanover)	1,000	154,574
Julius Schlinder	Peine	400	48,685
Deutsche Vacuum	Schulau (Wedel)	400	62,356
Ersag Wintershall	Salzbergen (Dendenhausen)	200	41,916
Julius Schlinder	Hamburg (Wilhelmsburg)	750	38,640
Albrecht	Hamburg (Wilhelmsburg)	500	15,259
Ernest Schielmann	Hamburg (Wilhelmsburg)	1,000	11,669
Europsische Tanklager	Hamburg (Petroleumhafen)	7,500	n.a.
Rhenania-Oseag	Hamburg	2,000	193,627
	Wietze	1,000	121,639
	Haltermann	500	36,344
Totals	14 plants	25,250	2,372,712

n.a. denotes information not available.

German Oil Production by Fields
(In Barrels)

FIELD	1940	1941	1942	1943	1944	1945	1946
Berkhoepen-Olheim	40,012	30,905	42,236	29,829	27,909	19,992	21,000
Broistedt	5,376	6,881	31,535	25,907	17,857	11,424	17,500
Ehra	21,840	11,970	7,616	5,663	2,709	308	
Emlichheim					21,119	35,231	105,000
Etzel				12,614	21,973	12,957	28,000
Fuhrberg	89,313	197,841	321,762	360,157	409,920	237,048	337,000
Galverlah						1,043	3,500
Georgsdorf					17,178	65,037	119,000
Giffhorn	29,050	25,270	20,636	22,687	21,252	12,425	7,000
Hademstorf			2,800	32,697	70,938	28,490	35,000
Hambuhren				7,959	15,547		14,000
Heide[2]	1,610,994	1,446,921	990,150	809,844	842,940	643,031	602,000
Hohenassel				8,036	104,111	219,611	413,000
Hope-Lindwedel							
Lingen			1,358	42,364	134,036	113,246	238,000
Meckelfeld	42,539	43,200	49,210	35,595	32,011	16,289	10,500
Molme	62,062	49,280	74,963	92,173	100,681	54,362	56,000
Nienhagen-Hanigsen-Eicklingen	2,219,952	2,195,844	2,050,629	2,029,185	1,751,701	1,245,293	1,344,000
Oberg	119,028	115,598	111,874	106,092	79,275	56,630	77,000
Reitbrook	2,560,547	1,473,325	728,182	368,984	251,679	243,376	238,000
Rhine Valley[3]	68,775	60,130	66,661	71,631	59,751	n.a.	85,000
Rodewald	281,309	359,030	334,460	372,498	374,731	165,004	308,000
Sottorf	11,046	5,404	2,254	868	644	70	
Thoren			88,214	172,333	159,779	106,988	126,000
Wietze	264,355	261,310	253,204	247,528	225,393	139,370	154,000
Wesendorf				79,331	239,987	343,140	308,000
Wienhausen			93,268	8,596	784	679	
Steimbke-Lichtenmoor							17,500
Totals	7,366,198	6,282,969	5,271,112	4,970,819	4,875,115	3,771,024	4,634,000

[1] 11 months actual, December estimated. [2] Includes Heide, Hemmingstedt, Kanzlei, Melderfhafen and Epenworden. [3] Includes Ubstadt, Forst, Bruchsal, Weiher and Weingarten. n.a. denotes data not available.

Engineering and Geological Data on German Fields

FIELD	Est. Proved Area Acres	Gravity of Oil API	PRODUCING FORMATION			Depth of Wells Ft.		Avg. Thickness of Pay Ft.	Type Structure
			Local Name	Kind	Geologic Age	Minimum Top Pay	Maximum Depth		
Hanover:									
Bentheim	3200	Gas	Zechstein	Lime	U. Permian			130	Anticline
Broistedt		30.2	Wealden	Sand	L. Cretaceous		4428		Salt dome
Berkhopen-Olheim		34.8	Rhaetic	Sand	U. Triassic	2690	3380	33	Salt dome
Ehra		16	Dogger	Sand	M. Jurassic		1850	20	Salt dome
Eicklingen		17-29	Wealden-Dogger-Rhaetic	Sand	Cretaceous		2400		Salt dome
Fuhrberg	275	15-27	Cornbrash	Sand	Jurassic		1315	50	Salt dome
Giffhorn		26	Fuhse	Sand	Jurassic		1320		Salt dome
Hademstorf		25.7	Wealden	Sand	L. Cretaceous		4918	7	Salt dome
Hanigsen		27	Valendis	Sand	Cretaceous		2673	75	Salt dome
		24.8	Wealden	Sand	L. Cretaceous		2706	50	Salt dome
Hambuhren	15	23.1	Cornbrash	Sand	Jurassic		1700	32	Salt dome
Hohenassel		31	Korallenoolith	Lime	Jurassic		1853		Salt dome
			Rhaetic	Sand	U. Triassic	262	492	23	
Molme		33	Wealden	Sand	L. Cretaceous	1279	1509	20	Salt dome
			Korallen	Lime	Jurassic		1575	52	
Nienhagen		33	Valendis-Wealden	Sand	Cretaceous	720	3938	33	Salt dome
Oberg		36.3	Dogger	Sand	Jurassic		2500	32	Salt dome
Rodewald		19.7	Cornbrash	Sand	M. Jurassic		2132		Salt dome
Thoren		18.7	Wealden	Sand	L. Cretaceous	1541	1870		Salt dome
		35.5	Cornbrash	Sand	M. Jurassic	2886	3018		
Wesendorf		35.8	Dogger	Sand	Jurassic		3280	25	Salt dome
Wietze		33.1	Wealden	Sand	L. Cretaceous		1476		Salt dome
Kiel:									
Heide		33.6	Zechstein	Lime	U. Permian				Salt dome
Dutch Border:									
Lingen	445	31	Wealden	Sand	L. Cretaceous	3230	3708		Fault
Emlichheim	247	25.7	Valendis	Sand	Cretaceous	2560	2640		Anticline
Georgsdorf	960	22.3	Valendis	Sand	Cretaceous		3215	100	Anticline
Hamburg:									
Reitbrook	840	21.3	Reitbrook	Lime	Cretaceous			25	Salt dome
Meckelfeld		24	Reitbrook	Lime	Cretaceous		1968		Salt dome
Sottorf		22.3	Senonian	Sand	U. Cretaceous				Salt dome
North Sea Coast:									
Etzel		13		Sand	Eocene				Salt dome
Rhine Valley:									
Forst-Weiher		33	Schilf	Sand	Triassic		1377	60	Fault
Weingarten		31	Meletta	Sand	Oligocene	1804	2230		Fault

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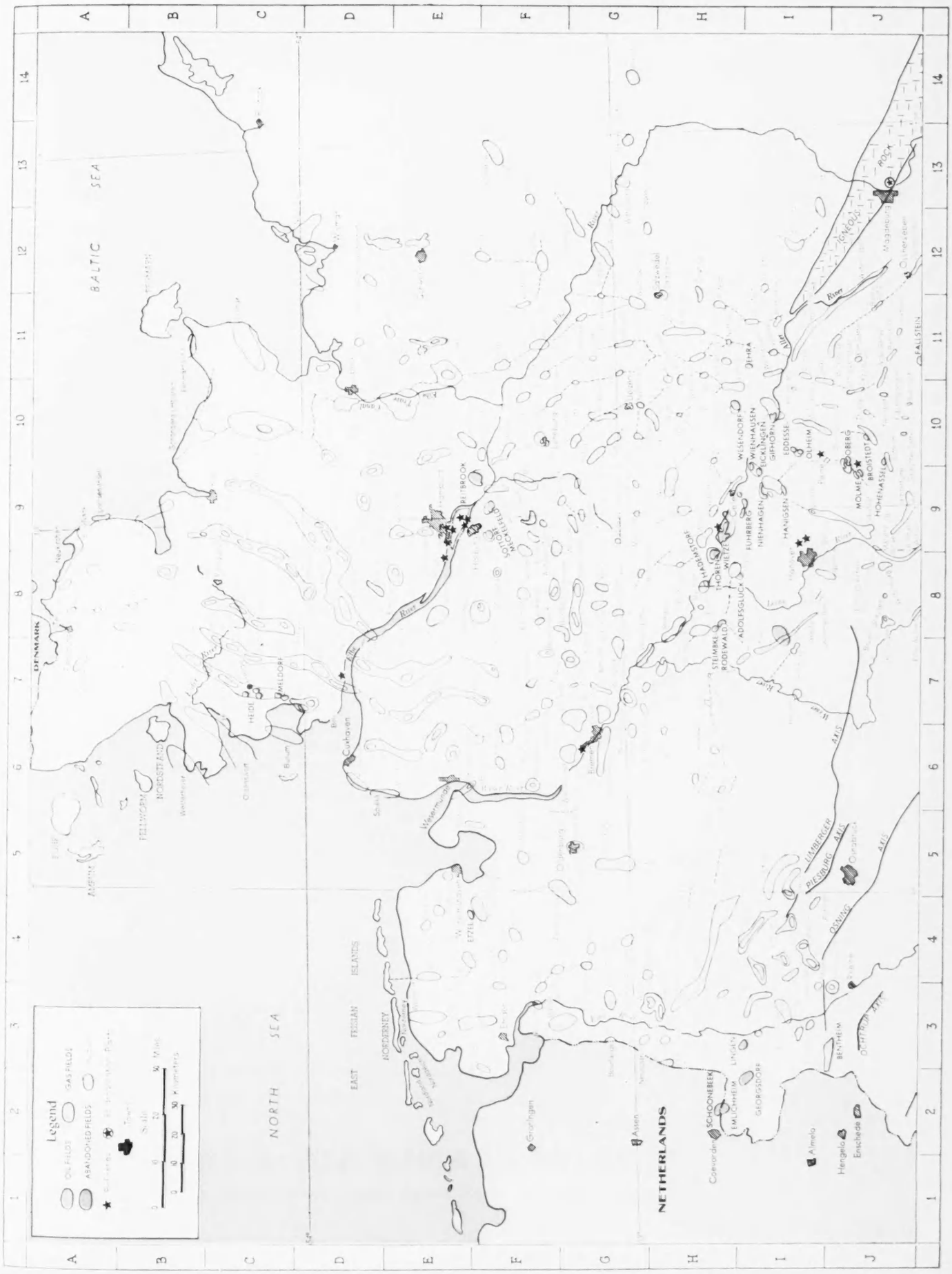
GERMANY—North Basin Fields and Structures



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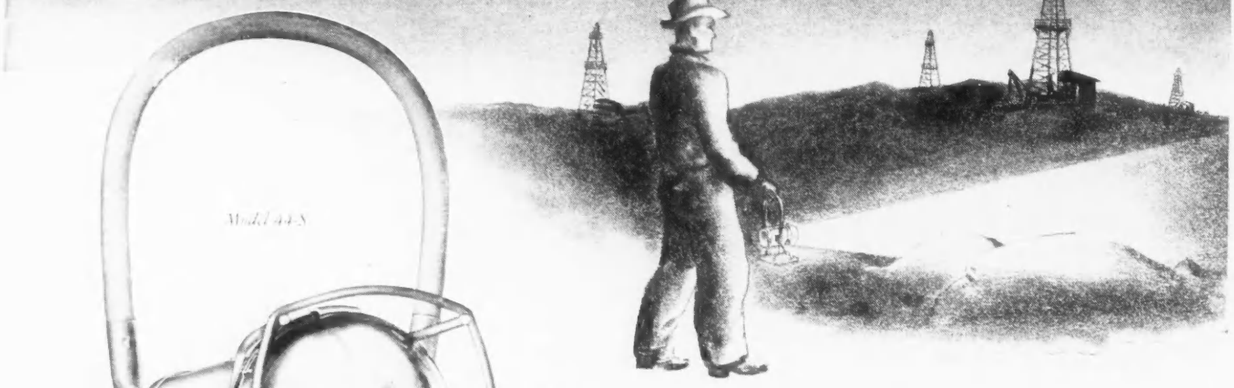

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Model 17-S. New hand-size service flashlight. Also double approved for your safety. Compact plastic (one piece) case takes three standard flashlight batteries. 1800 candlepower gives long range with clear lens. Use with honeycomb lens for short range flood light. Belt clip and carrying ring are attached to case. Angle of lens unit allows you to place light on level surface and get illumination where you need it.

Model 1955-S. For maintenance work that requires two free hands—6-volt. Uses standard lantern battery. Battery case worn on strap and belt (supplied). Lens and bulb housing worn on head, wrist, knee or chest. Special bracket allows light to be focused in any direction. Clear or honeycomb lenses available and interchangeable. Added safety feature is kick-out socket.

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GREAT BRITAIN

A SHARP drop in crude oil production was reported during 1946 for Great Britain. Total output was 410,235 barrels as compared with 529,000 barrels in 1945. All but 1235 barrels of the 1946 production by D'Arcy Exploration Company, Ltd., subsidiary of Anglo-Iranian Oil Company, Ltd., in fields located in England. The only other oil production in Great Britain is by Anglo-American Oil Company in the Dalkeith field, in Scotland. At the end of the year 242 wells were producing.

During the year five field wells were completed with the total footage drilled being 9700 feet. At the end of the year only one field was active. Wildcatting also declined some from 1945 with only six tests being completed last year. Five of these were drilled by D'Arcy and one by Anglo-American.

Drilling in Fields of England

COUNTY AND FIELD	WELLS COMPLETED IN FIELDS IN 1946					Field Wells Drilling and Shut Down at End of 1946		
				Total				
	Oil	Gas	Dry	Wells	Footage	Dr.	SD	Total
Nottinghamshire:								
Eakring	2			2	4512			
Duke's Wood	1			1	2625			
Caunton			1	1	2308	1		1
Lancashire:								
Formby	1			1	255			
Totals	4		1	5	9700	1		1

Producing Wells and Oil Production of Great Britain

COUNTRY, COUNTY, FIELD	Year of Discovery	OIL WELLS AT END OF 1946		CRUDE OIL PRODUCTION (Barrels)			
		Producing					
		Art. Lift	Total Producing	Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
ENGLAND:							
Nottinghamshire:							
Eakring	1939	55[1]	55	295	121,000	104,000	968,000
Duke's Wood	1941	113	113	450	257,000	182,000	1,579,000
Kelham Hills	1941	54	54	215	113,000	89,000	719,000
Caunton	1943	10	10	80	34,000	31,000	122,000
Lancashire:							
Formby	1939	8	8	7	4,000	3,000	54,000
SCOTLAND:							
Midlothian:							
Dalkeith		2	2			1,235	n.a.
Totals		242	242	1047	529,000	410,235	3,442,000

n.a. Denotes data not available.
[1] Includes one flowing well.

Wildcats Completed in Great Britain in 1946

COUNTRY AND COUNTY	Company and Well	Date Completed	Total Depth (Feet)	Results
England:				
Derbyshire	D'Arcy's Whittington 1	Jan.	3369	Dry.
Yorkshire	D'Arcy's Ellenthorpe 1	Jan.	3598	Dry.
Yorkshire	D'Arcy's Kirkleatham 2	June	3091	Dry.
Yorkshire	D'Arcy's Hayton 1	Sept.	3822	Dry.
Doncaster	Anglo-American's Gringley 1		5000	Dry.
Scotland:				
West Lothian	D'Arcy's Easter Pardovan 1	Mar.	3183	Dry.

Refineries of Great Britain

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
England					
AGWI Pet. Corp., Ltd. (Standard, N.J.)	Fawley (Southampton)	12,000	7,000	S-C-A	Operating
Anglo-American Oil Co., Ltd.	Pt. Ellesmere (West Cheshire)	500	None	Skim-Lube	Operating
Berry, Wiggins & Co., Ltd.	Kingsnorth-on-Medway	2,500	None	Skim-Lube	Unknown
	Weaster (North Manchester)	1,500	None	Skimming	Unknown
Cory Bros & Co., Ltd.	Coryton	5,000	2,000	Skim-Crk	Unknown
Herbert Green & Co., Ltd.	E. Halton (Lincolnshire)	1,500	None	Skim-Lube	Unknown
Lobitos Oilfields, Ltd.	Pt. Ellesmere	4,000	None	Skimming	Operating
London and Coastal Wharves, Ltd.	Thames Haven (London)	18,000	None	Skim-Lube	Unknown
Major & Co., Ltd.	Hull	1,250	None		Unknown
Manchester Oil Refinery, Ltd.	Trafford Park (Manchester)	3,250	None	Skim-Lube	Operating
Medway Oil & Storage Co., Ltd.	Isle of Grain (Kent)	3,500	2,000	Skim-Crk	Unknown
Petrochemicals, Ltd.	Partington (Manchester)	1,000			Building
Shell Refineries, Ltd.	Shell Haven (on the Thames)	15,000	None	Skim-Lube	Unknown
"Trimpell", Ltd. (Trinidad, Imperial and Shell Group)	Heysham (Lancashire)		12,500	Skim-Crk	Shut Down
Ireland					
Irish National Refineries, Ltd.	Dublin				Building
Scotland					
Anglo-Iranian Oil Co., Ltd.	Grangemouth (on-the-Forth)	15,000	4,000	S-C-L	Operating
Scottish Oils, Ltd.	Uphall, (Edinburg)	2,500	500	S-C-L	Unknown
Shell Refineries, Ltd.	Ardrossan (Ayershire on the Firth of Forth)	5,000	1,500	Complete	Operating
William Briggs & Sons	Dundee	700	None	Skimming	Unknown
Wales					
National Oil Refineries, Ltd. (Anglo-Iranian)	Llandarcy (Caermarthen)	22,000	7,500	Complete	Operating

Engineering and Geological Data on England's Oil Fields

COUNTY & FIELD	Range of Gravity of Oil API	PRODUCING FORMATIONS			Depth of Wells (Ft.)		Average Thickness of Pay (Feet)	Type Structure
		Name	Kind	Age	Minimum Top Pay	Maximum Total Depth		
Nottinghamshire:								
Eakring	34.4-37.6	B. Sandstone Rough Rock Longshaw Grit Chatsworth Grit Kinderscout Grit	Sandstone	Upper Carboniferous	1,780	2,260	10 60 20 100 40	Dome with faulting.
Duke's Wood	32.5-33.6	B. Sandstone Rough Rock Longshaw Grit Chatsworth Grit Lower Carboniferous	Sandstone Limestone	Upper and Lower Carboniferous	1,800 2,500	2,270 2,640	20 70 20 60 70	Dome with faulting.
Kelham Hills	27.1-29.3	Upper Grit Lower Grit	Sandstone	Upper Carboniferous	2,050	2,280	40 30	Dome with faulting.
Caunton	29.3-31.1	Upper Grit Middle Grit	Sandstone	Upper Carboniferous	2,170	2,300	12 12	Dome with faulting.
Lancashire:								
Formby	37.0	Keuper Waterstones	Sandstone and Shaley Clay	Trias	80	250	20	Faulted Monocline.

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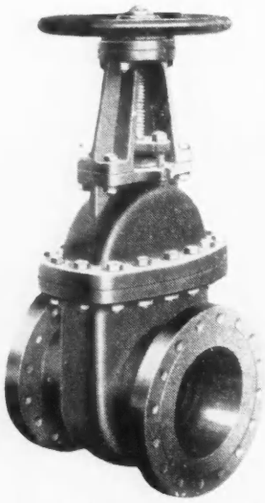
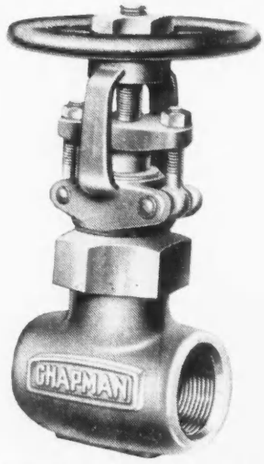
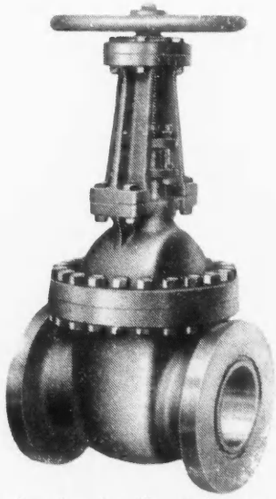


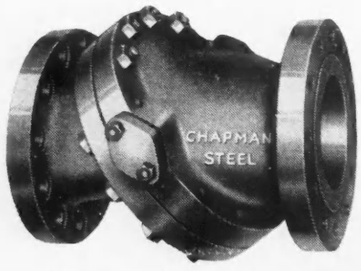
Iron Body Bronze Mounted Solid Wedge Gate Valves. Also made in parallel seat, double disc type. Sizes 2" to 36".



List 960 Forged Steel Gate Valves. In carbon or alloy steels, with superhardened seats and plugs.



One of a series of iron body bronze mounted double disc parallel seat gate valves for oil, water and gas.



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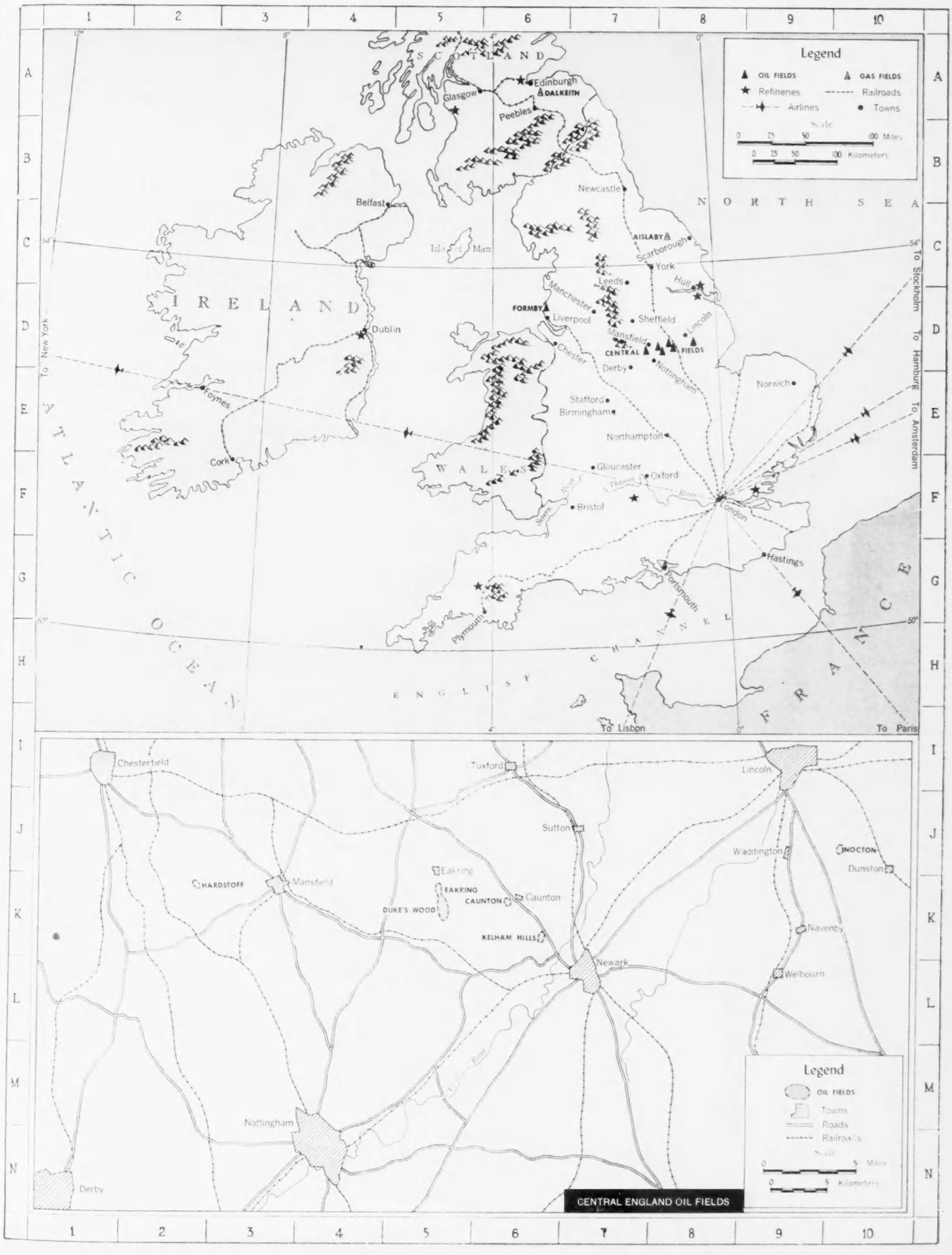
GREAT BRITAIN—Central England Fields



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Process design of the plant pictured was developed by the Research and Development Department of The Atlantic Refining Company. All other phases of the project including the field piping systems were developed and completed by HUDSON in collaboration with the Engineering and Construction Department of The Atlantic Refining Company.

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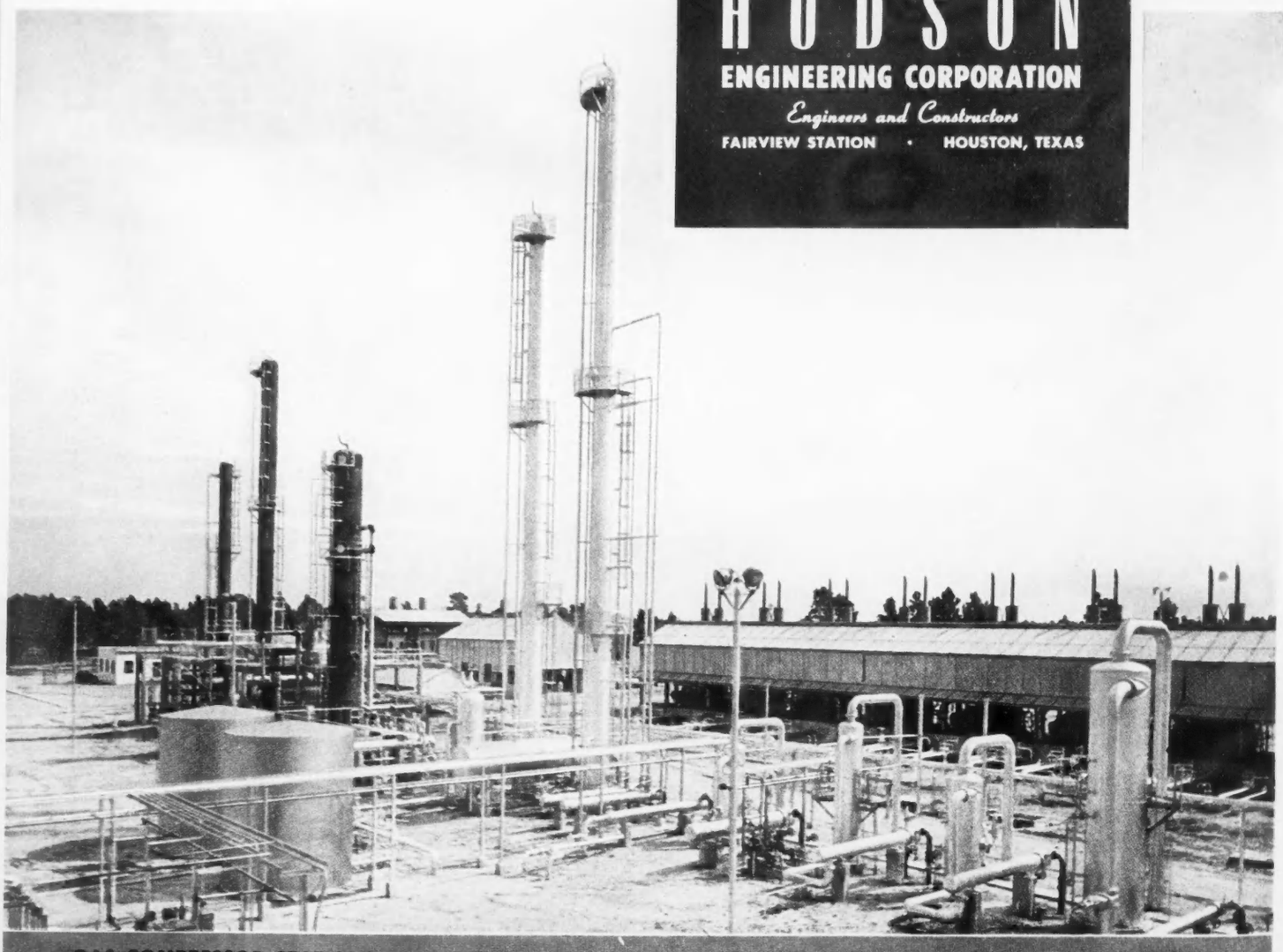

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HUNGARY

ONLY three of Hungary's five fields contributed to the country's production output during 1946, with closing in of the negligible one barrel-a-day Ujfalu field south of Lovaszi, and the government-operated Bukkszek field in northern Hungary. However, the total output from MAORT's Budafapuszta, Lovaszi and Hahot fields was increased slightly during 1946 to bring the total of 5,145,342 barrels slightly above the 1945 figure of 5,020,695 barrels, but well under the 1943 peak of 6,425,718 barrels produced under the spur of German occupation and war needs. It is not likely that any increase will be seen in 1947, since the Budafapuszta field is now considered completely developed and the Lovaszi field failed to increase its production for the year through the completion of 12 producing oil wells. At the close of the year, 24 of the 79 wells on production at Lovaszi were being operated on artificial lift. Of 75 wells producing at Budafapuszta, 36 are pumping and 39 flowing. No wells were drilled in this field during 1946.

Hahot field, northeast of Budafapuszta, a 1942 discovery, received some development during the year with three wells drilled, but all three were gas producers. This field's 552,699 barrels were produced from five wells.

The MAORT concern (Magyar Amerkai Olajipari Reszvenytarasag) a Standard Oil Co. (New Jersey) subsidiary, operator of the southwestern Hungary fields, would no doubt under normal production practices, reduce the take from its fields by at least 20 to 25 percent, since the fields are all reservoirs with gas as the principal source of energy and no appreciable water drive, but have thus far been unable to do so. They are in the Russian-occupied zone, and production and destination of crude has been at the direction of the government which has diverted most of it to Russia as reparations. The operating company has been paid by the government for the crude, but official representatives have prescribed producing rates. Engineering studies indicate that at these rates a considerable amount of gas is dropping out of solution and being produced separately, and it is feared that continuation of the rates may result in loss of much otherwise recoverable crude. Pressure maintenance projects under way have not been entirely successful under current operating conditions.

Drilling operations have shown a pronounced decrease during 1945 and 1946, at a time when it is thought that development is important to continued producing capacity, but this is largely due to the lack of sufficient equipment to maintain an accelerated program, and foreign operators are reluctant to make any substantial capital investment in critical materials in an area where the economic and political situation is not regarded as stable. Two wildcats were drilled during the year in the area south of the Lovaszi field, both of which were abandoned, although one had some slight showings of oil. At the close of the year two rigs were active in exploratory work and five rigs in field development, four at Lovaszi.

To date there has been no commercial production established east of the Danube with the exception of the Bukkszek field, but during the war years some exploration has been carried on, mostly by the Germans, on a 4 million-acre concession granted to a German concern under the management of the Wintershall Company. Several wells were drilled, and two showed evidence of possible future importance. One test at Korosszegapati, 125 miles east-southeast of Budapest found sand at 2500 feet from which it made an estimated 1,750,000 cubic feet of wet gas daily along with some distillate. Another, near Totkomlos, 110 miles southeast of Budapest was drilled to 5312 feet where it blew out making an estimated 20 million cubic feet of gas daily from Pliocene pay at 5092-5312 feet. It was killed and plugged, but another well drilled in the same area showed mostly salt water with some gas and about two barrels of oil daily and was abandoned.

During the years 1941-1943 six wildcats were drilled near Alsolendva west of Lovaszi and all found sands corresponding to those in the Lovaszi field. Two produced some oil—one an 80-barrel and the other a 40-barrel well—while the other four made gas, the combined potential of all four being estimated at 5.8 million cubic feet daily. South of this area a well was drilled in 1944 by Italian-German Mur-Land Oil Company at Peteshaza which showed some oil and water. Two sands were found between 5472 and 5600 feet, but initial production amounted to only about 75 barrels of oil plus about 10 barrels of water a day.

Producing Wells and Crude Production of Hungary

FIELD	Year of Discovery	Oil Wells at End of 1946				Crude Oil Production (Barrels)		
		Producing						
		Shut in	Flowing	Total Art. Lift	Producing	Year 1945	Year 1946	Cumulative Through 1946
Bukkszek	1937					1,567		85,134
Budafapuszta	1937		39	36	75	1,540,460	1,562,712	14,638,254
Lovaszi	1940		55	24	79	3,122,498	3,029,931	17,506,266
Hahot	1942		4	1	5	356,171	552,699	2,349,374
Ujfalu	1941	4				Field	Shut in	13,362
Totals		4	98	61	159	5,020,696	5,145,342	34,592,390

Engineering and Geological Data on Hungarian Oil Fields

FIELD	Est. Proved Area Acres	Gravity of Oil (API)	Kind (Lime, Sand, etc.)	PRODUCING FORMATION				Type Structure
				Geologic Age	Depth of Wells (Ft.) Minimum Top Pay	Depth of Wells (Ft.) Maximum Depth Wells	Avg. Thickness of Pay (Ft.)	
Bukkszek				Oligocene	250	4462		Anticline
Budafapuszta	2330	42.5	Sand	Pliocene	3500	5786	39	Anticline
Lovaszi	2550	40	Sand	Pliocene	3950	5139	75	Dome
Hahot	145	31.3	Lime-stone	Pliocene-Miocene	4675	4770	98	Buried Hill
Ujfalu	86		Sand	Pliocene	2300	5790	22	Dome

Drilling in Hungarian Fields

FIELD	Wells Completed in Fields in 1946					Field Wells Drilling and Shut Down at End of 1946		
	Oil	Gas	Dry	Total Wells	Total Footage	Dr.	SD	Total
Bukkszek								
Budafapuszta								
Lovaszi	12			12	63,000	4		4
Hahot		3		3	15,750	1		1
Ujfalu								
Totals	12	3		15	78,750	5		5

Refineries of Hungary

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
Fanto Associated Hungarian Oil Co., Ltd.	Budapest	1,100	None	Skim-Lube	Operating
Hazai Koclajnar Reszvemutarsaag	Budapest	1,000	None	Skim-Lube	Operating
Magyar Hydrobenzin Reszvemutarsaag	Petfurdo	1,200	350	Skim-Crack	Operating
Magyar Olaj Nuvek	Szony	1,350	None		Operating
Magyar Petroleum-Dr. Freund	Csepel (Budapest)	1,100	None	Skim	Operating
Nyiregyhaza Petroleumgyar Reszvemutarsaag	Nyiregyhaza	300	None	Skim-Lube	Operating
Shell Koolaj Reszvemutarsaag	Csepel (Budapest)	3,850	None	Skim-Lube	Operating
Szoregi Petroleumfabrik	Szoregi	420	None	Skim	Operating
Vacuum Oil Co. Reszvemutarsaag	Almasfuzito	3,800	None	Lube-Wax-Asphalt	Operating
Totals	9 Plants	14,220	350		

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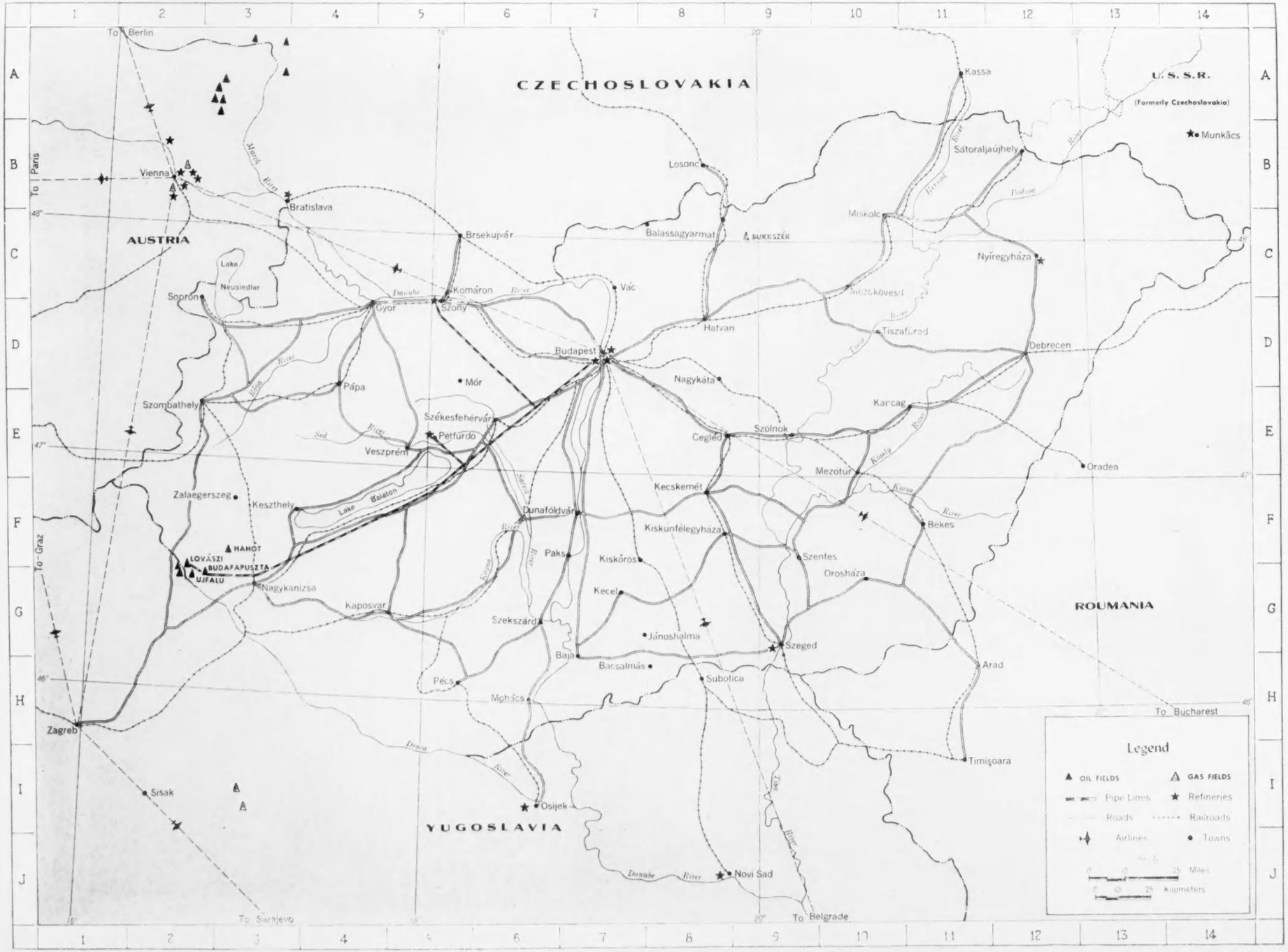
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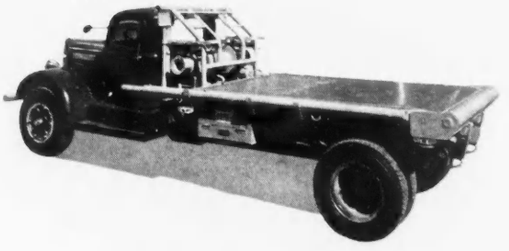
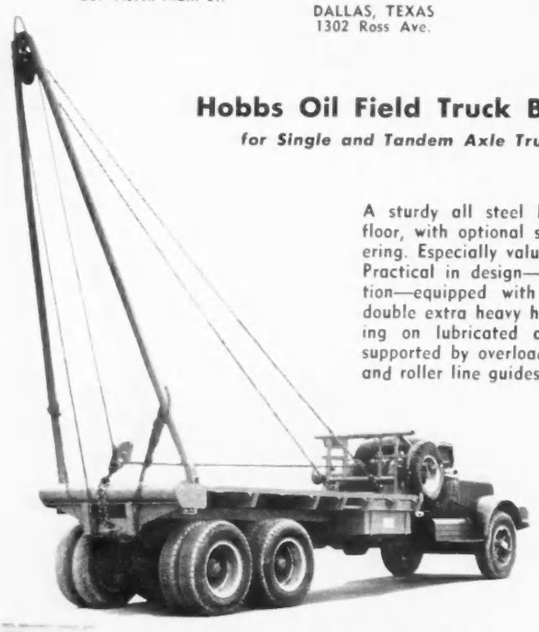
Hobbs Oil Field Truck Bodies

for Single and Tandem Axle Trucks



A sturdy all steel body with solid oak floor, with optional steel deck plate covering. Especially valuable for moving rigs. Practical in design—durable in construction—equipped with roller tail pipe of double extra heavy hydraulic pipe operating on lubricated anti-friction bearings supported by overload rollers at 3 points, and roller line guides to prevent wear and tear on cable. Drill pipe gin poles, telescoped in 2 lengths. All steel headache post made of pipe and easily removed for winch repairs and service. Chassis for 1½-ton to 12-ton trucks. Tailormade to fit trucks.



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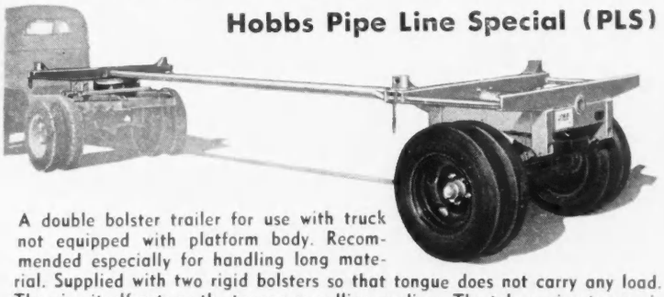
Hobbs WT4 Tandem Pole Trailer

Capacity 60,000 lbs. Truck and Trailer; 30,000 lbs. Trailer alone. No load on pole. Because of separately mounted axles and adjustable bail type tongue, WT4 is used as conventional pole trailer, 4-wheel trailer, or wagon behind truck or tractor.

Hobbs Oil Field Special (OFS)

The HOBBS (OFS) OIL FIELD SPECIAL Trailer is built to be used behind trucks in oil fields where Oil Field Body is on the truck. Both bolsters are fully oscillating to facilitate loading and to permit sharp turns with minimum amount of bending. Pressed steel channel, electrically welded frame assures longer service and fewer repairs. Frame is flexible to eliminate cracking under hard usage.

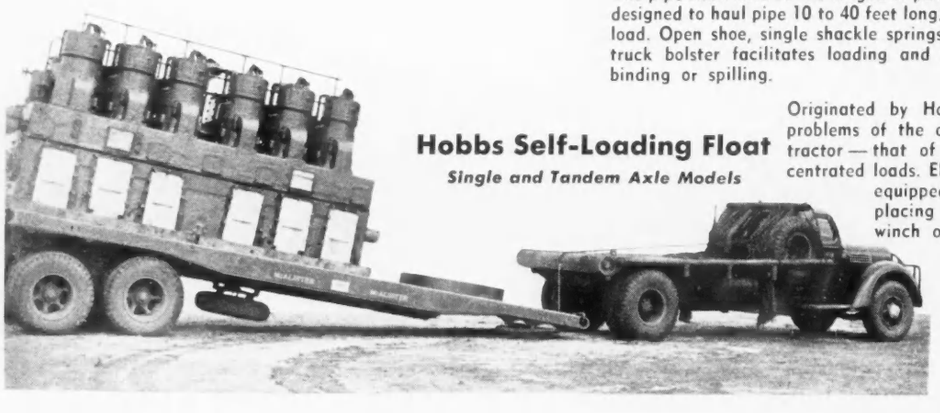
Hobbs Pipe Line Special (PLS)



A double bolster trailer for use with truck not equipped with platform body. Recommended especially for handling long material. Supplied with two rigid bolsters so that tongue does not carry any load. The pipe itself acts as the tongue or pulling medium. The telescoping tongue is designed to haul pipe 10 to 40 feet long. The sliding lugs are adjustable to any load. Open shoe, single shackle springs minimize side sway. Fully oscillating truck bolster facilitates loading and enables making sharp turns without binding or spilling.

Hobbs Self-Loading Float

Single and Tandem Axle Models



Originated by Hobbs as solution to one of biggest problems of the oil field operator and the road contractor — that of loading and unloading heavy, concentrated loads. ELIMINATES need of additional trucks equipped with winches and gin poles for placing load on trailer. Makes use of power winch on truck as means of lowering float to ramp position. Then truck is backed up to rear of trailer and winch pulls load on. When load is in place truck is again moved to front and winch lifts trailer back up into traveling position. One man easily can handle entire operation of loading and unloading.

ITALY

RENEWED interest in oil exploration has developed in Italy since the war, with some American companies already actively engaged in finding new oil sources.

Italian fields in 1946 produced 85,302 barrels of crude oil and about 2,466,500,000 cubic feet of gas which is a slight increase over the output in 1945. The only oil area to be seriously damaged during the war was the Ripi area near Rome and rehabilitation work is under way there.

The foreign oil companies which operated in Italy before the war have regained possession of all of their subsidiaries which were seized by the Italian government, and new boards of directors have been appointed by the companies. Standard Oil Company (New Jersey) has reorganized the Societa Petrolifera Italiana through which it is carrying out exploration activity in Northern Italy. It is reported also that The Texas Company and Gulf Oil Corporation are interested in creating Italian subsidiaries, including a company to operate tankers under the Italian flag. Societa Petrolifera Italiana now controls about one-half of Italy's production.

MacMillan Petroleum Corporation of New York has obtained a concession from the Italian government on about 32,000 acres in Sicily, located in the Licata, Aragona, Cattolica and Joppolo Gientascio districts. The company is reported to have already started work. A large asphalt deposit is located at Ragusa in Sicily, but, as yet, no commercial oil production has been established.

The Italian government's operating company is Azienda Generale Italiana Petroli which now is reported being reorganized financially. The Italian Petroleum Board (Comitato Italiana Petroli) has been replaced by Cooperative Nazionale Italiana per il Petrolio (CONIP) which will have charge of all imports of oil and petroleum products into Italy. The CONIP likely will affiliate with the international oil cooperative set up at a meeting in Zurich, Switzerland, in 1946.

Recent Activity

Nearly all of the Italian oil production is from fields in the north part of the country, in the region of the Po River, between Milan and Bologna.

Most of the oil production is in the provinces of Parma and Piacenza where the fields have been extensively repaired of their war damage, and in 1946 produced about 65,000 barrels of oil. The Pietramala fields in Florence and Bologna provinces, yielded 7200 barrels of oil in 1946 and have been relinked with Florence by a natural gas pipe line. Plans also are afoot for a Pietramala district-Rome gas line.

The Ripi field, Frosinone Province, produced 4000 barrels of oil in 1946 but this will be increased in 1947. The Lodi structure, generally considered the most promising of all structures in Italy, is being developed by Azienda Generale Italiana Petroli. Natural gas was found in large quantities at 4300 feet and oil at 8900 feet in a test drilled in 1943-44. Gas production from this field in 1946 totaled 70 million cubic feet.

Efforts are being made to rehabilitate Italy's refining industry which will operate mainly on imported crude. The plant, located at Naples is said to have resumed operations at rate of 153,000 barrels monthly. Standard Oil Company (New Jersey) is reported to have purchased 40 percent of the shares of Azienda Nazionale Idrogenazione Combustibili, in which the Italian government and Montecetini Chemical Products Company are interested, and ANIC has started reconstruction of its hydrogenation plant at Leghorn. This plant was destroyed by air raids. The reconstruction work is slated for completion by the end of 1947. Standard and the Shell group have also started rebuilding their plants in the Leghorn area and are reported considering the possibility of building a new refinery at Leghorn. The Bari plant, owned by ANIC, has begun operation at the rate of 191,300 barrels monthly.

AGIP has started reconstruction of its Aquila refinery at Trieste and has also ordered new catalytic cracking units for its plant at Venice. The Aquila refinery will be rebuilt with a capacity of about 3½ million barrels annually.

Data on Italian Refineries

COMPANY	Location of Plant	Crude Charging Capacity, (Bbls. Daily)	Cracking Capacity, (Bbls. Daily)	Type of Refinery	Operating Status
Azienda Generale Italiana Petroli	Venice	14,000	3,100	Skim-Crk.	Operating
Azienda Nazionale Idrogenazione Combustibili	Bari	7,000	4,400	S-C-W-A-	Operating
A. N. I. C. Raffineria de Napoli S.A.I. (Socony-Vacuum)	Leghorn	7,000	4,400	S-C-W-A	Operating
Distillazione Italiana	Naples	5,500	4,000	Skim-Crk	Damaged
Combustibili S.A.	Porto Maghera (Venice)	5,000	3,500	Skim-Crk	Rebuilding
"Nafta" Societa Italiana del Petrolio ed Affini (Dutch-Shell)	La Spezia	12,000	4,000	Skim-Crk	Operating
Societa Petrolifera Italiana (Standard Jersey)	Fornova (Parma)	1,000	None	Skimming	Operating
Societa Idrocarburi Nazionali de Florence	Pietramala				Operating
Total	8 Plants	51,500	23,400		

Geology and Production of Italian Oil and Gas Fields

FIELD AND PROVINCE	Operating Company	Year Discovered	Producing Wells	1946 PRODUCTION GAS (cu. ft.)	1946 PRODUCTION Oil (Bbls.)	Geologic Age	Type Structure
Bando, **Ferrara**	Societa Petrolifera Italiana	1943	n.a.	21,400,000		Quaternary	Horizontal Strata
Bellena-Fontivivo, **Parma**	Azienda Generale Italiana Petroleum	1930	2	6,000,000		Pliocene, Miocene	Anticline and Monocline
Consandolo, **Ferrara**	Societa Idrocarboni Nazionali	1937	n.a.	108,500,000		Quaternary	Horizontal Strata
Eastern Po Plain, **Rovigo-Ferrara**	Many Small Companies	1935	n.a.	1,370,000,000		Quaternary	Horizontal Strata
Lodi, **Milano**	Azienda Generale Italiana Petroleum	1943	1	70,000,000		Pliocene	Anticline
Malalbergo, **Ferrara**	Societa Petrolifera Italiana	1943	2	67,500,000		Quarternary	Horizontal Strata
Montechino-Velleja, **Pracenza**		1890	60	19,000,000	7,800	Eocene-Cretaceous	Anticline
Parma Province, **Parma**	Azienda Generale Italiana Petroleum		5	8,000,000	2,100	Pliocene-Miocene	Anticline
Pietramala-Castel Dell' Alpi, **Florence** and **Bologna**	Societa Idrocarboni Nazionali	1925	n.a.	140,000,000	7,200	Cretaceous-Miocene	Anticline
Podenzano, **Piacenza**	Azienda Generale Italiana Petroleum	1931	n.a.	120,000,000	3,000	Pliocene-Miocene	Anticline
Rallio, **Piacenza**	SURGI and RAI	1908	3	300,000	1,500	Eocene	Anticline
Ripi, **Piacenza**	Azienda Generale Italiana Petroleum	1920	5		4,000	Miocene	Anticline
Salso, **Parma**	Societa Petrolifera Italiana	1923	64	20,500,000	6,685	Miocene	Anticline
Salso Terme, **Parma**	Terme and Statali	n.a.	n.a.	180,000,000	930	Miocene	Anticline
San Giorgio, **Piacenza**	Azienda Generale Italiana Petroleum	1942	7	190,000,000	3,400	Miocene	Anticline
Tocco Casauria, **Pescora**	Azienda Generale Italiana Petroleum	1935	6		6,000	Miocene	Anticline
Tramutola, **Pescora**	Azienda Generale Italiana Petroleum	1936	n.a.		5,700	Eocene	Anticline
Valleza, **Parma**	Societa Petrolifera Italiana	1907	150	105,000,000	36,793	Oligocene-Eocene	Monocline
Vizzela, **Parma**	Societa Petrolifera Italiana	1941	n.a.	40,300,000	2,194	Pliocene, Miocene	Anticline
Totals			305	2,466,500,000	85,302		

n.a. denotes data not available.

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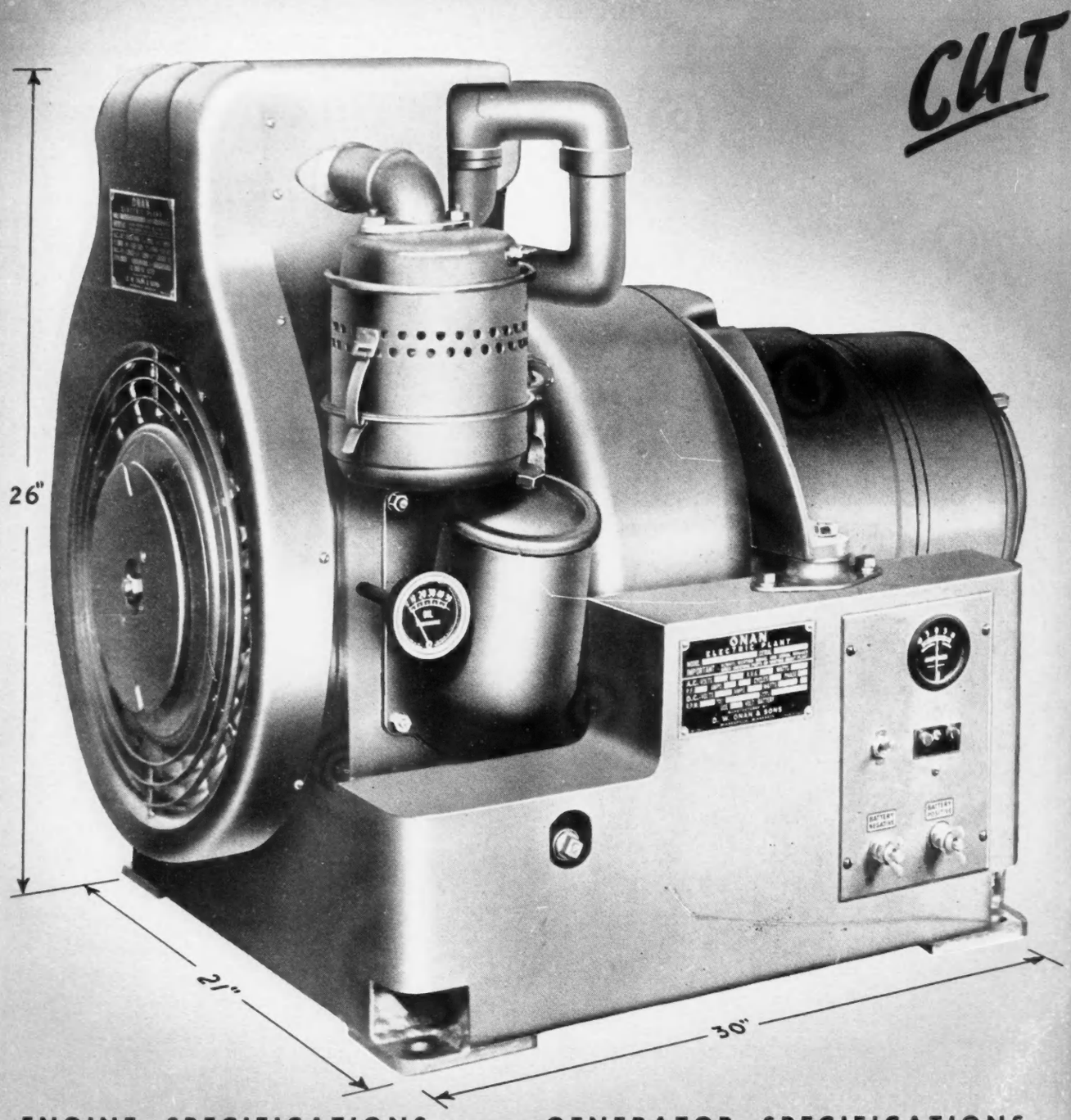
ITALY— Po Valley Fields



ENGINE SPECIFICATIONS

ENGINE: 4-cycle, vertical single cylinder; 3½" bore 3½" stroke; 32.7 cu. inch piston replacement; 17.3:1 compression ratio; 5 HP at 1800 rpm.; air-cooled (solid injection) full Diesel. Basic aluminum construction. Pressure lubrication, high pressure throttling-type injection pump, ball type governor. 12-volt Electric Starting.

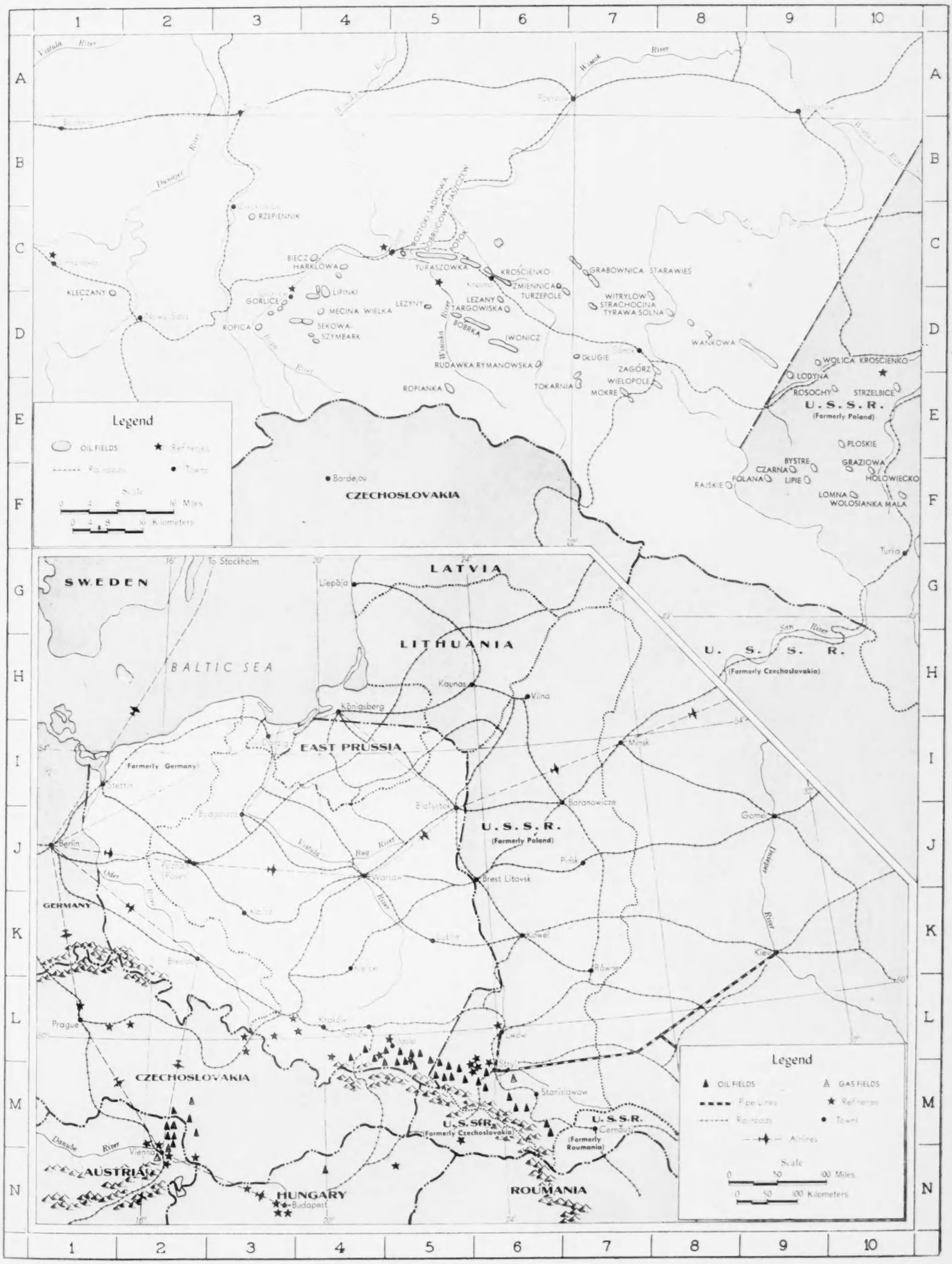
GENERATOR SPECIFICATIONS

GENERATOR: 4-pole, self-excited, self-regulated, 2,500-watt A.C. generator. Direct connected to engine for permanent alignment. 12-volt D.C. circuit for charging starting batteries.

DIMENSIONS: Length 30", Height 26", Width 21".

NET WEIGHT: (without batteries) 325#.

POLAND— Southern Fields



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POLAND

THE Polish oil industry, crippled by the war and the shifting of its frontiers, made vigorous efforts toward reconstruction during 1946. Considering the conditions that prevailed, some degree of success was attained.

Annexation by the Soviet Union of the eastern portion of Poland deprived the Polish oil industry of about four-fifths of its prewar production. Poland's present oil industry is built around a few shallow, depleted pools, producing through stripper type wells with equipment worn out during six years of war and internal unrest.

Since about 1870, Poland has had commercial oil production. Before the war, this was largely in the hands of several independent Polish operators and two important French-Polish companies—Societe Francaise Industrielle et Commerciale des Petroles, and Societe Francaise des Petroles de Silva Plana. The only United States firm producing oil in Poland was Vacuum Oil Company, S. A., a subsidiary of Socony-Vacuum, which had production and a refinery at Czeshowice. All branches of the petroleum industry were nationalized following the war.

Crude Production

Poland's oil production for the first 10 months of 1946 amounted to 710,603 barrels. Assuming that November and December production continued at the October rate, output for 1946 would amount to about 865,000 barrels. This compares with a total of 770,377 barrels produced during 1945.

The increase in production was obtained primarily by completion of new wells in areas already producing. However, work is progressing on increasing production of old wells by shooting, cleaning out, repressuring and water flooding. Mining of shallow horizons also has been initiated.

At the end of October, 1946, Poland had 2361 wells producing a daily average of 2471 barrels. All but six of these wells were on artificial lift. During the 10-months period 76 wells were completed—69 being oil producers. Total footage drilled was 86,730 feet.

Poland's main effort in concentrated on development of new reserves. During November, 1946, nine exploratory wells were drilling on prospects isolated by the prewar geological and geophysical surveys. One of these wildcats, the Debosz, located in the western part of the country, near Cieszyn, encountered gas at a depth of 1188 feet. The well showed an open flow potential of about 5 million cubic feet daily. Two other tests are to be drilled in the area immediately. A well being drilled in the Sadlowa-Roztoki area found non-commercial oil shows at 4194 feet and is drilling deeper.

Geological and geophysical studies are being carried on and as soon as suitable equipment becomes available a number of deep wildcat tests will be drilled.

Moving from Schwarzheide, Germany, and erection at Oswiecim, Poland, of a synthetic fuel plant was continued during the year. Rehabilitation of refineries made good progress. At present there are six refineries in the country with a total crude charging capacity of about 7100 barrels daily.

The Polish oil industry is working under a Three-Year Plan, having as its purpose making Poland independent of petroleum imports. For the time being imports are needed to satisfy most of the country's petroleum demand.

Refineries of Poland

COMPANY	Location of Plant	Total Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls Daily)	Type of Refinery	Operating Status
Galizische Karpathen Pet. A. G.	Jedlice	1200	None	Skim-Lube	Operating
Industrial Oil Works	Jaslo	1500	None	Skim-Lube	Operating
Standard Nobel Co. in Poland, Ltd.	Libusza	1280	None	Skim-Lube	Operating
Vacuum Oil Co. S. A., Post-Dziedzice.	Czechowice	1600	300	S-L-Wax	Operating
Polskie Swiazkowe Refinerje Alejow Skanych.	Trzebinia	1500	None	Skim-Lube	Operating
Total	5 Plants	7080	300		

Engineering and Geological Data on Poland Oil Fields

FIELD	Year Discovered	Gravity of Oil (API)	PRODUCING FORMATION		
			Geologic Age	Depth of Wells (Ft.)	Type Structure
Biecz	1897	39	Eocene	480-1440	Diap. Fold.
Bobrka	1858	34	Eoc. Cre.	480-3200	Anticline
Gorlice	1931	35	Oligocene	360-1450	Unsym. Fold
Harklowa	1870	27	Oligocene	720	Overthrust
Iwonicz	1890	29.3	Oligocene	450-2400	Anticline
Kleczany	1858	31-50	Cretaceous	300-1600	Unsym. Fold
Lipinki	1865	34	Eoc. Cre.	500-2500	Anticline
Krosno	1888	32	Eocene	900-2000	Diap. Fold.
Mecina	1909	42	Eoc. Cre.	2400-4160	Diap. Fold
Mokre	1914	35-45	Oligocene	650-1800	Anticline
Potok	1891	39-51	Eoc. Cre.	416-1120	Diap.
Ropianko	1868	31	Cretaceous	390-1120	Anticline
Rudawka-Rymanow	1899	36.3	Oligocene	1200-3150	Anticline
Rzepiennik	1930	39.6	Cretaceous	1410	Anticline
Sekowa-Szymbark	1875	35	Eoc. Cre.	500-1000	Anticline
Grabownica-Sta	1896	37-47	Eoc. Cre.	650-3300	Diap.
Tryawa-Solna	1897	35	Oligocene	330- 350	Narrow Fold
Wankowa	1885	31-36	Oligocene	2460-2625	Diap. Fold
Weglowka	1887	27-30	Cretaceous	250-1500	Anticline
Witrylow	1880	42.8	Eoc. Cre.	350-1200	Narrow Fold
Turzepole	1896	33	Eocene	1480	Anticline
Zagorz	1885	24.5	Oligocene	1160-2338	Anticline

Producing Oil Wells, Crude Oil Production, and Drilling in Poland

FIELD	Oil Wells at End of October, 1946				Crude Oil Production Barrels		Wells Completed in Fields Through October, 1946			
	Shut in	Producing			Daily at End of Oct. 1946	Jan.-Oct., 1946	Oil and Gas	Dry	Total	
		Flowing	Art. Lift	Total Producing					Wells	Footage
Kleczany-Starawies			9	9	1	293				17,240
Sekowa-Szymbark	4		71	71	17	5,660	4	1	5	3,969
Rzepiennik Strz	1		3	3	2	552				
Mecina Wielka			32	32	5	1,421				
Gorlice-Ropica Polska	1		113	113	94	27,606		1	1	230
Gorlice-Lipinki	60		761	761	502	149,130	10	2	12	11,959
Biecz	6		55	55	72	22,196	4	1	5	4,648
Harklowa	12		154	154	124	37,457	2	1	3	1,853
Roztoki-Sadkowa		2	1	3	23	5,422	4		4	5,232
Dobrucowa-Jaszczew	4	2	15	17	88	24,399	1		1	3,972
Potok	15		44	44	75	24,303		1	1	2,578
Turaszowka	24		53	53	229	71,170				636
Kroscienko	3	1	48	49	56	16,972				194
Bratkowka										371
Weglowka	5		83	83	43	13,842				
Iwonicz Pld.	9		83	83	75	24,289	4		4	3,070
Iwonicz Wies-Iwonicz	10		31	31	4	1,253				715
Lezyny			1	1	2	756				
Bobrka	10		113	113	168	48,845	3		3	6,573
Ropianka	9		9	9	3	346				
Lezany-Targowiska			2	2	2	770	1		1	62
Dlugie			12	12	1	305				
Rudawka Rymanow Tokar	5		15	15	3	994				
Zmiennica-Turzepole	13		54	54	118	34,771	1		1	5,028
Grabownica-Starawies	6		84	84	320	83,603	30		30	11,391
Strachocina	1									3,785
Zagorz-Wielopole	2		9	9	8	1,245				
Mokre-Rajskie	20		52	52	75	8,786	4		4	1,535
Witrylow	2	1	23	24	7	2,545				158
Tyrawa Sol	2		29	29	19	4,128				
Wankowa	10		385	385	335	102,744	1		1	531
Total	234	6	2,355	2,361	2,471	710,603	69	7	76	86,730

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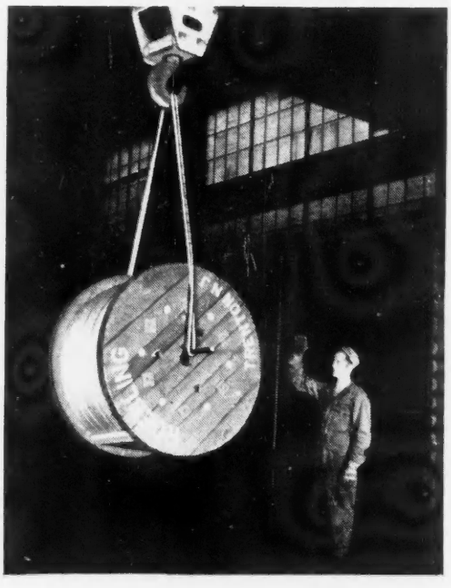

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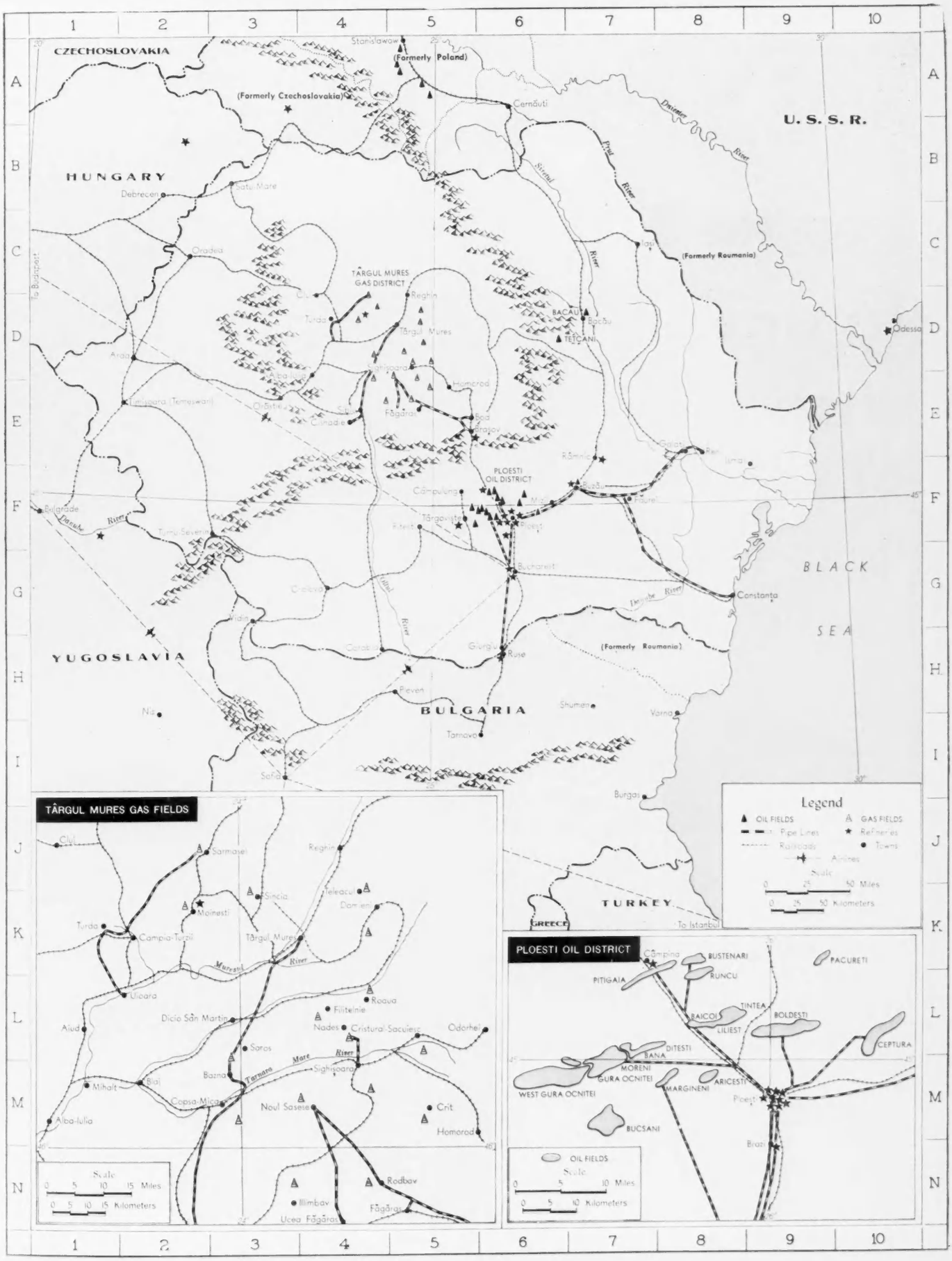
ROUMANIA—Ploesti and Targul Mures Fields



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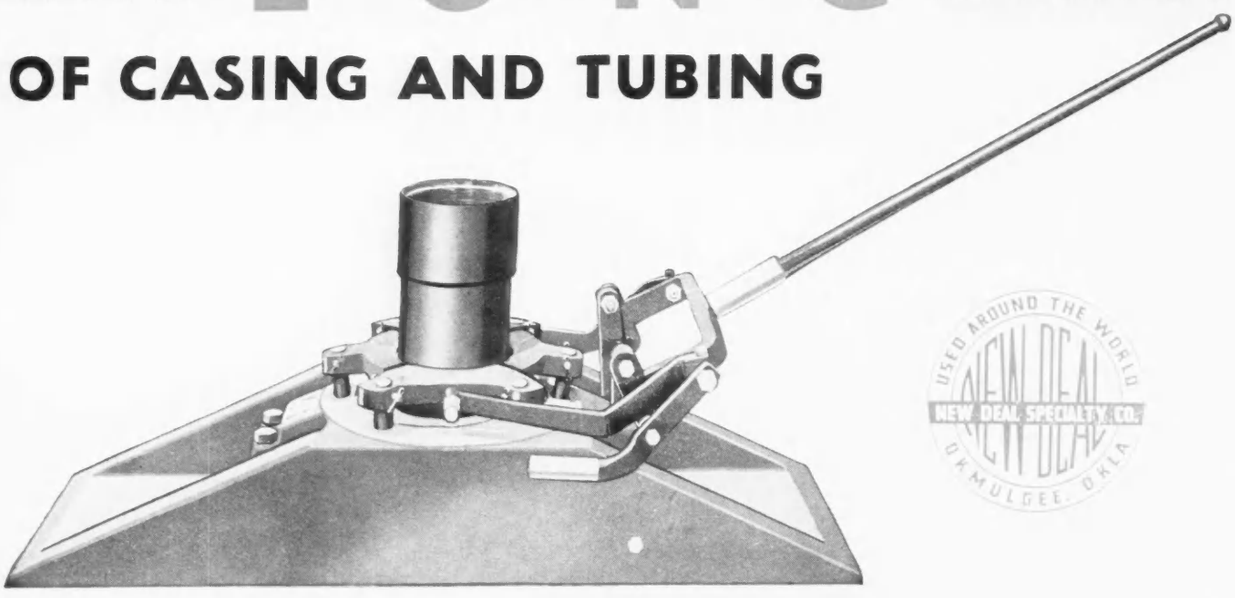

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ROUMANIA

PRODUCTION and drilling activities in Roumania showed a downward trend during 1946 due, primarily, to the scarcity of drilling and pumping equipment and lack of capital.

Total footage drilled in 1946 was 438,505 feet as compared with 520,900 feet in 1945, or a decrease of 15 percent. Exploratory wells included in the total footage amounted to 40,900 feet in 1946 against 63,400 feet in 1945, or a decrease of 35 percent. This unusually sharp drop of exploratory drilling is undoubtedly a contributing factor in the decline of production from 34,502,700 barrels in 1945 to 31,464,200 barrels in 1946, or a drop of about 10 percent, and will be reflected in an anticipated future downward trend.

The Shell group's subsidiary, Astra Romana, continues to be the leading company in Roumania, accounting for 28.6 percent of the drilling and 31.5 percent of the production in 1946. Standard Oil Company (New Jersey) subsidiary, Romano-Americana, follows in second place with 13.6 percent of the drilling and 12.8 percent of the production.

No important new fields have been found in Roumania since 1937, with the only major new oil source since that time being deep production in the Baicoi-Tintea area, which produced 6,924,800 barrels in 1946 or 22 percent of the country's total output. Exploration drilling expanded materially from 1940 to 1943 under German occupation, but from 1944 through 1946 it was virtually at a standstill. From 1940 to 1943, a total of 50 wildcat tests were drilled of which all but 10 were in the Ploesti area and 6 of these 10 wells were near producing fields in Moldova. All 10 tests outside of Ploesti were failures. Of the 40 wildcat tests drilled in the Ploesti area, only three discoveries of minor importance were made and two of these could be classed as extensions.

The Roumanian government has issued an exploration permit for oil and gas in a 20,000-acre tract in western Transylvania in the vicinity of the town of Arad. The exploration is to be carried out by a group of companies, among which are the USSR-controlled Sovrompetrol and Jersey Standard's subsidiary, Romano-Americana.

Gas Production

Development of natural gas fields in Transylvania (Targal Mures) continued to expand during the war. Three new fields were discovered, increasing the total to nine fields. Gas deposits at Targal Mures occur in the Sarmatian (Miocene) sands with the depths being less than 5000 feet. Production during 1946 from the Targal Mures gas fields totaled about 19 million cubic feet as compared with 18 million cubic feet in 1945. Cumulative gas production at the end of 1946 is estimated at 261 million cubic feet.

The refining capacity of Roumania has been built back to about 140,000 barrels daily as compared with 220,000 barrels daily in 1940. Repairs have been made with salvaged materials.

Geological Data on Roumanian Fields

Province and Field	Gravity of Oil	PRODUCING FORMATION		
		Local Name	Kind	Geologic Age
Prahova:				
Moreni-Gura Ocnitei	33	Dacic, Meotic, Helvetian	Sand	Pliocene, Miocene
Filipesti de Padure	43	Meotic	Sand	Pliocene
Margineni	39	Meotic, Sarmatian	Sand	Miocene
Aricesti	35	Meotic	Sand	Pliocene
Campina	41	Meotic	Sand	Pliocene
Pitigaia-Dragauneasa	36	Helvetian	Sand	Miocene
Bustanari-Runcu	42	Meotic, Helvetian, Oligocene	Sand	Pliocene, Miocene, Oligocene
Floresti		Meotic	Sand	Pliocene
Baicoi-Tintea-Liliesti	39	Dacic, Meotic	Sand	Pliocene
Boldesti-Paulesti	37	Meotic	Sand	Pliocene
Scaiosi	40	Meotic	Sand	Pliocene
Malaesti-Magurele	32	Meotic	Sand	Pliocene
Copaceni	41	Meotic	Sand	Pliocene
Matita-Atarnati	42	Meotic	Sand	Pliocene
Ceptura	34	Meotic	Sand	Pliocene
Zemes-Tazlau	43	Oligocene	Sand	Oligocene
Stanesti-Solorti	45	Oligocene	Sand	Oligocene
Tescansi	43	Helvetian	Sand	Miocene
Dambovita:				
Mahil-Rosu	37	Sarmatian	Sand	Miocene
Bucsani	38	Meotic	Sand	Pliocene
Doicesti	39	Meotic	Sand	Pliocene
Glodeni	38	Meotic	Sand	Pliocene
Bazau:				
Arbanasi	39	Meotic	Sand	Pliocene
Berca		Meotic	Sand	Pliocene
Sarata Monteoru	38	Meotic	Sand	Pliocene
Bacau:				
Mounesti	43	Meotic, Oligocene, Eocene	Sand	Pliocene, Oligocene, Eocene

Footage Drilled and Oil Production in Roumania

FIELD	Year Discovered	Footage Drilled, 1946	CRUDE OIL PRODUCTION (Barrels)		
			Year 1945	Year 1946	Cumulative Through 1946
Moreni-Gura Ocnitei	1903	160,641	13,943,200	12,729,700	616,750,300
Filipesti de Padure	1910	21,130	1,520,800	1,208,200	7,218,000
Margineni	1935	859	266,800	240,000	5,666,800
Aricesti	1921	7,150	15,700	14,300	8,162,800
Campina	1884		194,500	203,800	34,634,800
Pitigaia-Dragauneasa	1938	4,454	140,100	119,800	992,600
Bustanari-Runcu	1857		741,100	515,000	112,980,200
Mahil-Rosu	1903				35,600
Floresti	1943	23,846	313,300	528,400	964,700
Baicoi-Tintea-Liliesti	1868	116,515	7,659,900	6,924,800	107,552,400
Boldesti-Paulesti	1922	9,400	3,840,300	3,438,900	107,034,500
Scaiosi	1930		4,600	1,515	123,415
Malaesti-Magurele	1938			23,600	50,600
Copaceni	1904			135,800	2,578,000
Matita-Atarnati	1899				102,200
Ceptura	1913	50,778	3,190,100	3,077,500	64,033,200
Bucsani	1933		1,048,600	971,000	42,880,600
Doicesti	1912				93,000
Glodeni	1897				594,200
Arbanasi	1869		172,300	155,500	17,180,800
Berca	1903	26,929	617,400	695,400	1,857,500
Sarata Monteoru	1869			27,600	3,923,300
Zemes-Tazlau	1860	1,299	255,600	250,100	6,394,300
Stanesti-Solorti	1860		54,000	47,900	5,164,800
Mounesti	1860	364	85,900	96,400	3,453,900
Tescansi	1860				1,021,700
Other Areas		15,140	438,400	58,985	6,562,585
Totals		438,505	34,502,700	31,464,200	158,006,800

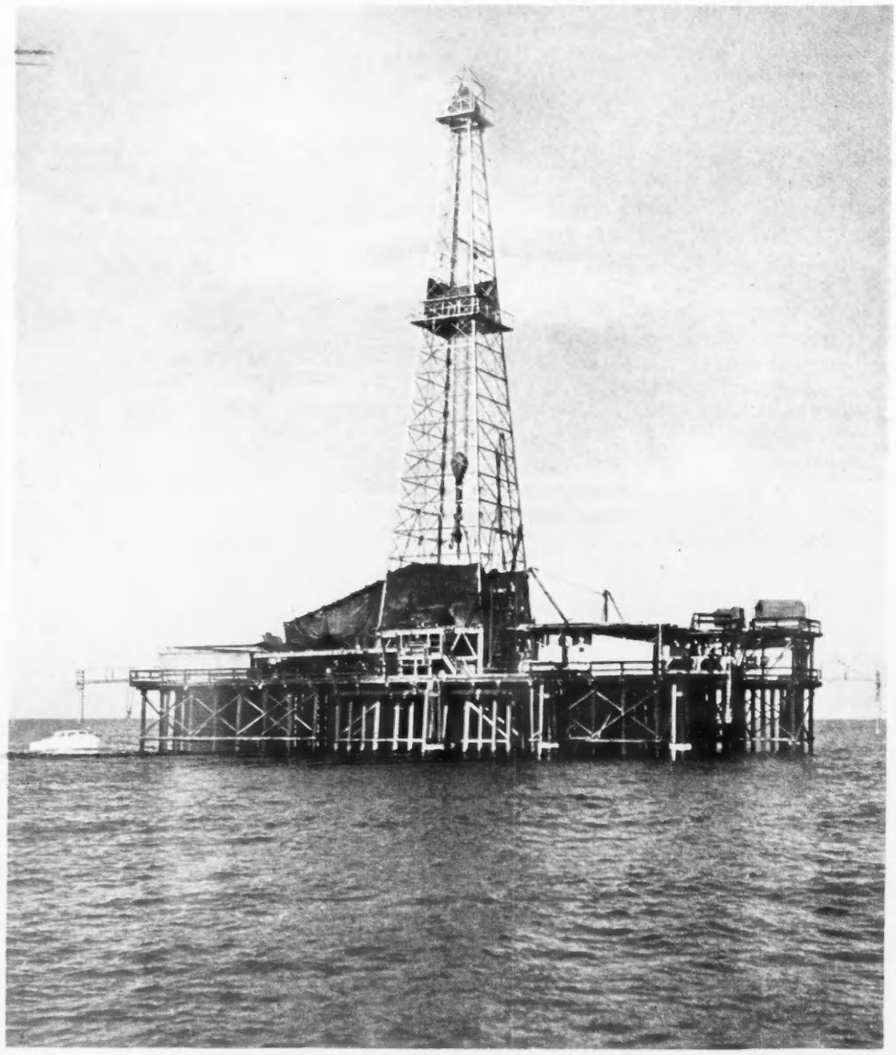
(1) Includes Morein, Ghirdoveni, Piscuoi, Rasvad, Valea, Voevozilor and Viforita.

Data on Refineries in Roumania

COMPANY	Location of Plant	Crude Charging Capacity (Barrels Daily)	Cracking Capacity (Barrels Daily)	Type of Refinery	Operating Status
Astra Romana S.A. (Dutch-Shell)	Ploesti-Sud	48,000	11,000	Complete	Operating
Colombia Societe Franco-Rumaine de Petrole	Ploesti-Sud	17,000	3,300	Skim.-Crk.	Operating
Concordia Societe Anonyme Rumaine pour l'Industrie du Petrole	Ploesti-Nord.	25,000	4,700	Skim.-Crk.	Operating
Creditul Miniere S.A. Rumaine	Brazi	10,600	3,500	Complete	Operating
Dacia Romano Pet. Synd. Ltd.	Ploesti-Nord.	2,650		Skim.	Operating
"Petrol Block" Societe Anonima Romana	Ploesti	11,600	4,700	Skim.-Crk.	Operating
"Photogen" Rafineria de Petrol S.A. (Socony-Vacuum)	Ploesti-Nord.	3,500		Skim.	Operating
"Unirea" Societate Anonima Romanada Petrole (Phoenix)	Ploesti	12,800	3,250	Skim.-Crk.	Operating
Romao-Americana S.A. (Standard of Jersey)	Ploesti	24,200	7,900	Skim.-Crk.	Operating
Steau Romana S.A.	Mounesti	7,000		Skim.	Operating
	Campina	6,500		Skim.	Operating
Intr. Niculescu Ciufu	Targaviste	150		Skim.	Operating
B. Blum	Margineni	300		Skim.	Operating
Prahova (Petrolul Bucarest)	Bucarest	3,600		Skim.	Operating
Xenia	Ploesti	4,500		Skim.	Operating
Astramina	Ploesti	1,400		Skim.	Operating
Est. Petrol	Ploesti	850		Skim.	Operating
Reznov	Ploesti	300		Skim.	Operating
David Ciurea	Ploesti	100		Skim.	Operating
Luceafarul	Ploesti	100		Skim.	Operating
Revoil	Ploesti	300		Skim.	Operating
Apollon Petrol	Ploesti	400		Skim.	Operating
Petrocarbon	Ploesti	500		Skim.	Operating
Major O. Pelin	Ploesti	100		Skim.	Operating
Total	24 Plants	181,450	38,350		

PARKERSBURG

ALL SET FOR A 125-MILE-AN-HOUR GALE



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There's nothing but water between this Parkersburg Derrick and the wide open spaces of the hurricane-haunted Gulf of Mexico. It's located on the first oil well ever drilled in unprotected open water, farther "at sea" than any previous well. This standard-design Parkersburg Derrick is calculated to safely withstand all the fury of a 125-mile an hour gale. That's proof again that you can depend on Parkersburg Derricks everytime for an extra margin of strength wherever strength counts. Parkersburg has been building faultlessly fabricated steel derricks for fifty years. Talk derricks with your Parkersburg Representative.

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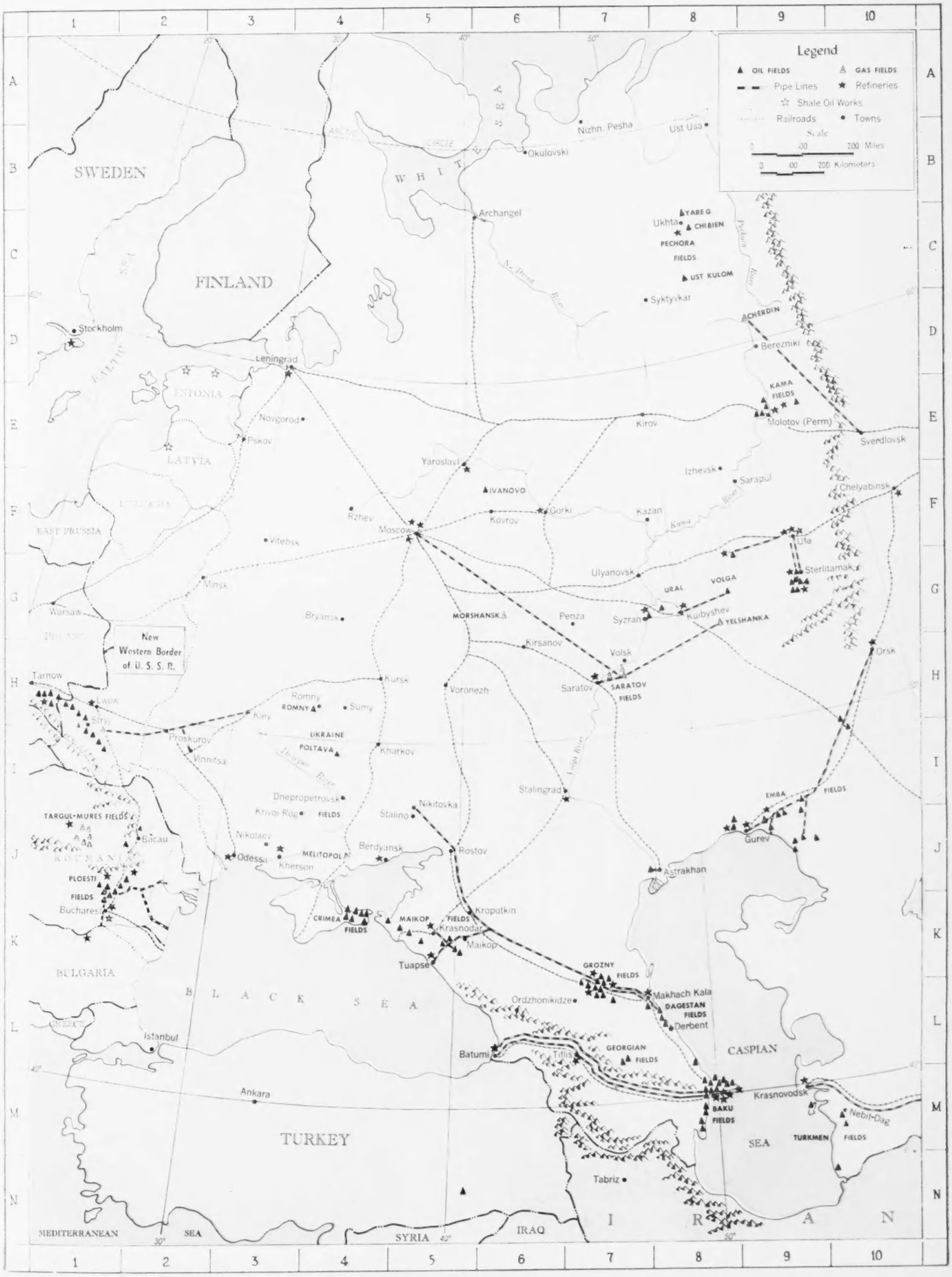
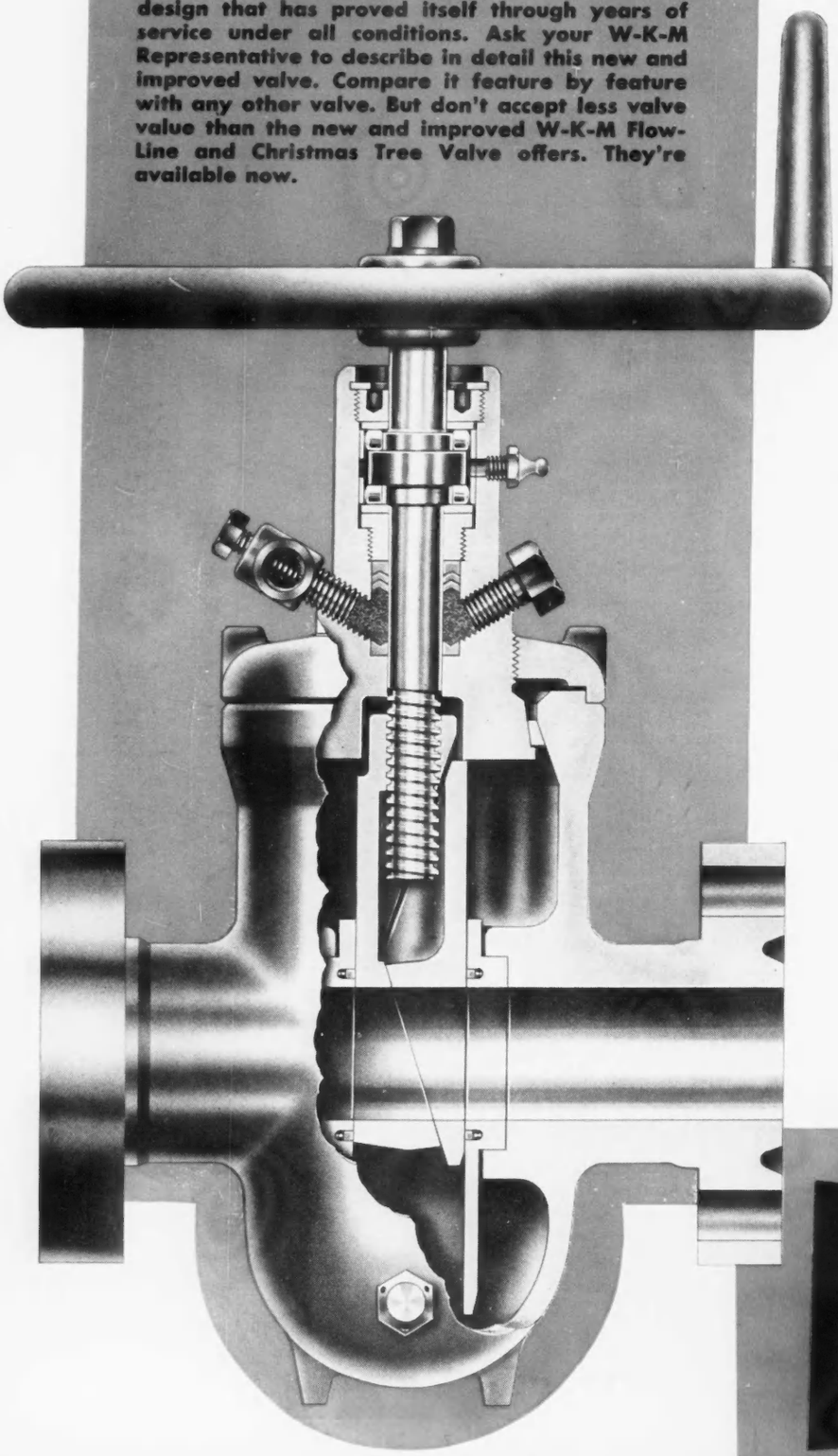
THE PARKERSBURG RIG & REEL CO. PARKERSBURG, W. VA.

U. S. S. R.— European Area



Here's the New W-K-M Flow-Line and Christmas Tree Valve with a *Pressure Seal Bonnet*

Now, W-K-M has made other substantial improvements in this universally preferred valve, none of which are "experimental." Improvements on the new and improved W-K-M Flow-Line and Christmas Tree Valve . . . with the pressure seal bonnet . . . are simply refinements of a W-K-M design that has proved itself through years of service under all conditions. Ask your W-K-M Representative to describe in detail this new and improved valve. Compare it feature by feature with any other valve. But don't accept less valve value than the new and improved W-K-M Flow-Line and Christmas Tree Valve offers. They're available now.



The new and improved W-K-M Flow-Line and Christmas Tree Valve has all the features operators have preferred in the past . . . plus these other new and exclusive features that keep W-K-M Valves tops in oilfield valves.

PRESSURE SEAL BONNET: Self-adjusting to pressure and temperature changes. There are no flanges, no studs and nuts.

DOUBLE ROLLER thrust bearings on stem for ease of operation. Stem threads are precision ground.

CHROME plated gates.

COMBINATION plastic-chevron packing—uses no gland or gland follower.

LUBRICANT contained in entire body — no special lubricant required—seal does not depend on lubricant.

THROUGH-CONDUIT opening — no turbulence—no restriction of flow.

PARALLEL expanding gates — seal directly across both seats with no distortion whatever —positive shut off both sides.

OVERSIZE bronze renewable seats.

COMBINATION wipe and seal rings keep the gate clean . . . pressure out . . . grease in.

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U. S. S. R.

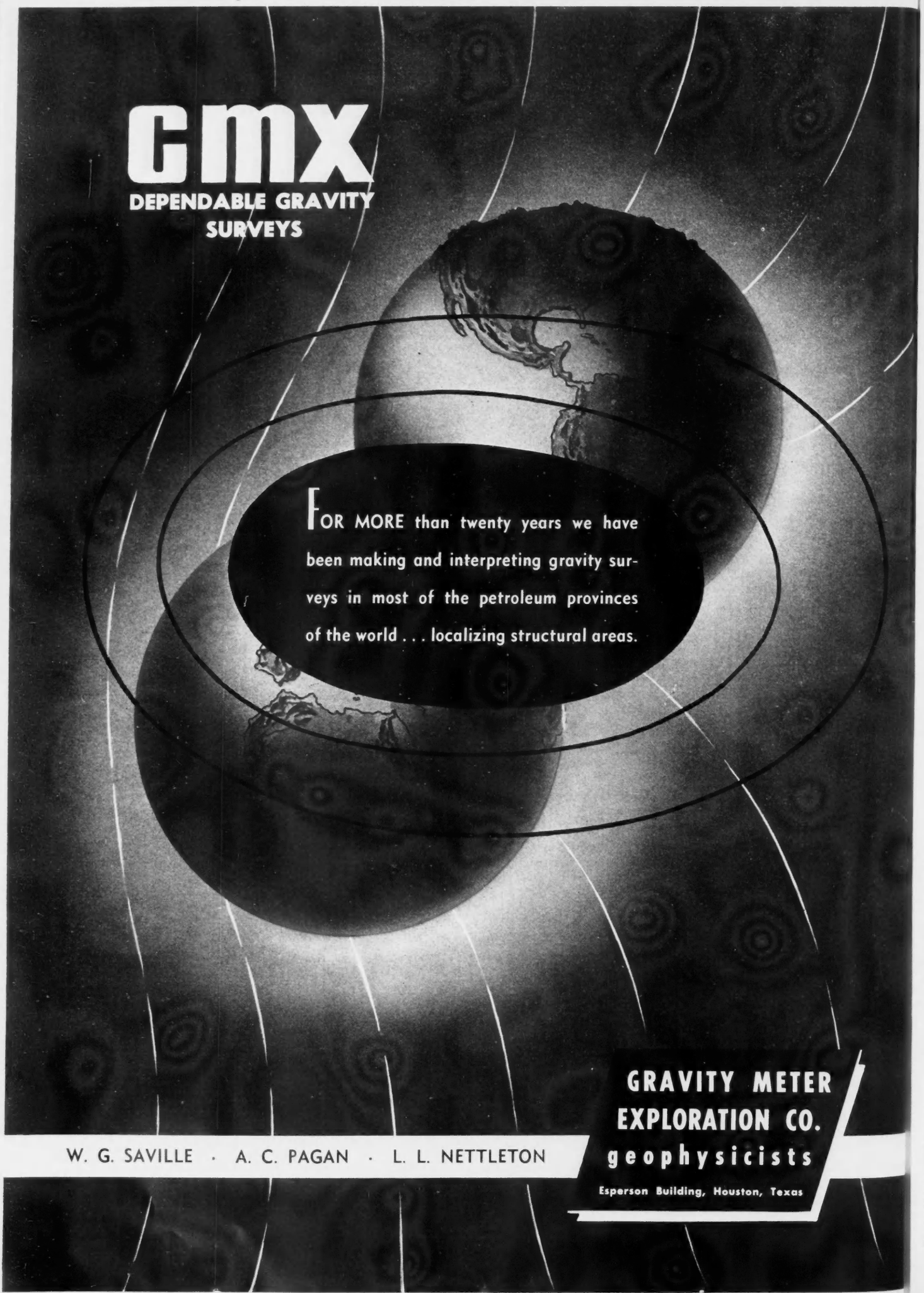
ALTHOUGH official figures on crude oil production in Soviet Russio continue to be a USSR secret, information now available from Russian sources indicates very definitely that estimates made by American government agencies, petroleum geologists, economists and others during the war were far in excess of the actual oil produced annually in the USSR. These sources indicate that the oil flow in the USSR declined steadily from 1941 through 1945.

However, data gleaned from recent information released from these same Russian sources point to increased oil production during 1946 as compared with 1945. The revised estimated output in 1945 was 148,950,000 barrels, or about 408,000 barrels daily, which was 212,000 barrels less than the 620,000 barrels daily estimated to have been produced in 1940. Russian information indicates that the 1946 output increased between 10 to 12 percent over 1945. This would indicate a production of 166,827,000 barrels in 1946, or about 443,000 barrels daily.

On March 1 the Council of Ministers of the USSR approved a 1947 program for the "rehabilitation and development of the national economy" which called for crude oil production in Russia during the current year to be increased

Engineering and Geological Data on U. S. S. R. European Fields

AREA AND FIELD	Discovery Year	Gravity of Oil (API)	PRODUCING FORMATION Age	Depth (Feet)	Type Structure
Baku (Azerbaijan) Area:					
Artem (Holy Island)	1904	19–24	M & L. Pliocene	3500– 9000	Anticlinal Fold
Baladzhary	1939		L. Pliocene	4729	Anticline
Bibi Eibat	1875	24–37	Middle Pliocene	3500– 5000	Anticline
Binagady	1903	21–35	Lower Pliocene	1500– 3116	Anticlinal Fold
Duvanny			Pliocene	Shallow	Anticline
Durov Dag			Middle Pliocene		Anticlinal Fold
Duz Dag			Middle Pliocene		Anticlinal Fold
Fatmay	1939		Upper Pliocene	1788	Anticline
Gamma			Middle Pliocene		Anticlinal Fold
Kala	1932	29–41	U. to L. Pliocene	2800– 4200	Dome on Fold
Kara Chkhur	1929	37	M. to L. Pliocene.	3440– 9000	Anticline
Kara Dag	1939		Middle Pliocene	5340	Anticlinal Fold
Kerges-Kyzyl Tepe	1929	22–31	Middle Pliocene		Anticline
Lenin (Balakhany, Sabunchy, Ramany)	1871	33–39	U. to L. Pliocene	3800– 5184	Anticline
Lok-Batan (Mikoyan)	1932	21–31	M. Miocene to Upper Pliocene.		Anticlinal Fold
Mahomedly			Upper Pliocene		Anticline
Miadjik	1936	gas	Middle Pliocene	Shallow	Anticline
Nephte Chala	1926		Pliocene		Folded Fault
Peschanny			M. to L. Pliocene.		Anticline
Pirsagat	1936		Middle Pliocene	4120	Anticlinal Fold
Puta (Molotov)	1926	22–36	Middle Pliocene		Anticlinal Fold
Surycha-Guilbakht	1938		Middle Pliocene		Anticlinal Fold
Shongar	1936		Middle Pliocene		Anticlinal Fold
Shuraabad	1936	36	Oligocene	Shallow	Overthrust F.
Shubany (Atashka)	1910	22–24	Lower Pliocene		Diapir Fold
Sion Shor	1939	23–29	Lower Pliocene	5180	Anticlinal Fold
Siazan	1876	36	Cretaceous & Olig		Overthrust F.
Surakhany	1910	29–49	U. to L. Pliocene	3800– 5200	Anticline
Sulu Tepe	1933	23–29	Lower Pliocene	5200	Anticlinal Fold
Touragai	1939		Middle Pliocene		Anticlinal Fold
Zykh (Beriya)	1935	37	M. to L. Pliocene.		Anticlinal & D
Crimea Area:					
Arma Eli			Middle Miocene		Anticlinal Fold
Changelek	1935	23–35	Middle Miocene		Diapir Fold
Kop Kochegen					Anticline
Kerleut			Middle Miocene		Anticlinal Fold
Maly Babchik			Middle Miocene		Anticlinal Fold
Mayak			Middle Miocene		Anticlinal Fold
Tarkhan			Middle Miocene		Anticlinal Fold
Daghestan Area:					
Acha Su	1932	30–26	Middle Miocene	985– 2300	Anticlinal Fold
Berekei	1901	31–33	Oligocene and Eocene Contact		Domal Uplift
Dag Ogni	1924	gas	Oligocene	60– 1000	Domal Fold
Duzlak		gas			Dome
Izber Bash	1936	38	M. & L. Miocene.	3025– 4685	Domal Anticline
Kara Kent	1932	22–32	Middle Miocene	655– 1640	Anticline
Emba Area:					
Alybai-Aral		gas			Salt Dome
Baichunas	1931	25–35	Jurassic		Salt Dome
Chernaya-Retchka			Jurassic	Shallow	Salt Dome
Dosser	1910	30.4	Jurassic	246– 690	Faulted Dome
Dshaksymai	1936	32			Faulted Dome
Iskine	1933		Jurassic-Salt core contact	2195	Salt Dome
Karagal		gas			Salt Dome
Kashkary	1944		Jurassic		Salt Dome
Koschagyl	1935	33	Jurassic	350– 1200	Salt Dome
Kulsary	1938		Jurassic		Salt Dome
Kurgus			Jurassic		Salt Dome
Makat	1915		Jurassic		Salt Dome
Novobogatinsk	1942		Jurassic		Salt Dome
Sagis	1936		L. Cretaceous and M. Jurassic	328– 2132	Faulted Dome
Shobarkuduk	1938				Salt Dome
Galicia (Former Polish) Area:					
Bitkow	1899	44	Oligocene	3610	Anticline
Beryslaw	1894	31–36	Olig. (Eoc., Cret.)	4270– 5700	Folds
Daszawa	1921	gas	Miocene	2300	Anticline
Kostnacz	1900	32	Cretaceous	1920	Anticline
Lodyna	1888	30–39	Oligocene	1150– 1900	Diapir Fold
Majdan	1889	29–37	Eocene	590– 1650	Anticline
Nahujowica	1892	19.8	Olig. and Eocene	535– 650	Anticline
Opaka	1896	43	Eocene	1970	Anticline
Orow	1891	25.7	Cretaceous	300– 1835	Fold
Polana	1880	35	Oligocene	325– 685	Anticline
Rajskie	1883	48.5	Oligocene	980– 1300	Assymet. Fold
Rypne	1887	37	Oligocene	500– 3700	Fold
Schodnica-Uryez	1872	36	Cretaceous	1480	Anticline
Slobada-Rungurska	1875	37	Cretaceous	400– 1000	Anticline
Strzelbice	1881	32	Cretaceous	660	Anticline
Georgian Area:					
Little Shiraki	1937	34–37	L. Plio. & U. Mio.	980– 7850	Anticlinal Fold
Mirzaani	1939	34–37	L. Plio. & U. Mio.	980– 7850	Anticlinal Fold
Nerio	1940		Cret. or Tertiary		Anticlinal Trd.
Sabsa Omareti	1939		Tertiary		Anticline
Grozny Area:					
Adi-Yurt		gas	Upper Miocene.	3650	Overthrust F
Akhazovski	1944		Middle Miocene		Folder Overtst
Ali Yurt	1944	33.5	Middle Miocene	9185	Overthrust F.
Bakovichi	1944		Middle Miocene		Anticline
Benci	1930	41	Oligocene	3600	Anticlinal Fold
Gorskaya Mountain	1926		Middle Miocene	3530	F. Anticline
Grozny, New (Oct.)	1913		Middle Miocene	7220–10200	Anticline
Grozny, Old	1893		Middle Miocene	7220–10200	Folded Anticline
Gudermes	1929	34	Middle Miocene	3940– 4595	Anticline
Gunushki	1934		Middle Miocene	4315	Anticline
Makhkety	1928		Middle Miocene	3280– 3940	Anticline
Malgobek	1927	25–36	Middle Miocene	990– 2300	Anticlinal Fold
Osunger	1939	47			Anticline
Sterch-Kert-Tycha	1931	41		3300	Anticline
Voznessenka	1901	25–36	Middle Miocene	990– 2300	Anticlinal Fold
Kama River Area:					
Goredki	1929	21	Permian	3200	Buried Reef
Krasnokamsk	1934	21–36	Permian and U. Carboniferous	530– 620 2950– 3103	Anticline
Overiata	1938	21–36	Permian & Upper Carboniferous		Anticline
Polazhinsky	1938	21–36	Permian & Upper Carboniferous		Anticline
Severokamsk	1938	21–36	Permian, U. Carboniferous, Dev	3400 3200– 5840	Anticline
Shilovo	1938		Permian	3152	Anticline
Kuban-Maikop Area:					
Abuzy	1938		Oligocene	2500– 4920	Monocline
Adaghum	1929	15–17	Upper Miocene.	985	Diapir Fold
Asrhalt Mountain	1937	37	L. Mio. and Olig	2240– 2950	Monocline
Bisk	1940	29.5	Oligocene		Monocline
Kalujsky	1927	21	Middle Miocene		Monocline
Kerlanty	1939			5050	Monocline
Keslerovo-Varenikovo	1936	21–41	U. Miocene & Olig	1148– 1640 2625– 3280	Diapir Fold
Khadyzhensky	1870	33	Oligocene	2240– 3480	Monocline
Krymsky-Kudako	1866	17–29	Middle Miocene	650– 1640	Anticline
Kura Tsitse	1937	33	L. Mio. & Olig	2250– 2950	Monocline
Kutaiss	1937	33	L. Mio. & Olig	2240– 2950	Monocline
Maikop (Apsheron)	1909	33	Lower Oligocene.	1640– 3480	Monocline
Sepsil	1939		Oligocene		
Shirokaya Balka	1909	33	L. Mio. & Olig	2240– 2950	Monocline
Suvorov-Cherkess	1914	33	Pliocene & Mio.	330– 1475	Domal Uplift
Pechora Area:					
Chibien			Devonian		Anticline
Ust Kulm	1939		Devonian		Anticline
Yareg			Devonian		Anticline
Saratov Area:					
Dergachi	1906	gas	Upper Pliocene	383– 3300	
Kurdium	1942	gas	Upper Pliocene	1716	
Teplovka		gas	Upper Pliocene	1320	
Yelshanka	1945	gas			
Ukraine Area:					
Melitcpol			Mesozoic		Salt Dome
Poltava					Salt Dome
Romny	1939		Mesozoic		Salt Dome
Ural-Volga Area:					
Allaguvat	1941		Lower Permian	1650– 2085	Buried Reef
Buguruslan	1937		Permian	985	Anticlinal
Buranchino	1939		Lower Permian	1640– 2085	Buried Reef
Ishimbaevo	1932	29.5	Lower Permian	1640– 2085	Buried Reef
Kinzibulatov	1943		Permian		Reef
Kusankul	1943	29	Lower Permian	1380– 2490	Buried Reef
Kuaminovka	1939		Lower Permian		Buried Reef
Shugarov	1942				
Smakaevo	1937	29	Lower Permian		Diapir Fold
Syzran	1934	31	U. & L. Carboniferous	2130– 3280	Domal Uplift
Termen-Yelga	1939		L. Perm. & Devo	2750	Reef
Tuimaza	1938	26	Carboniferous	3440– 3775	Buried Reef
Yablonovo (Stavropol)	1937	31	U. & L. Carboniferous	2120– 3284	Domal Uplift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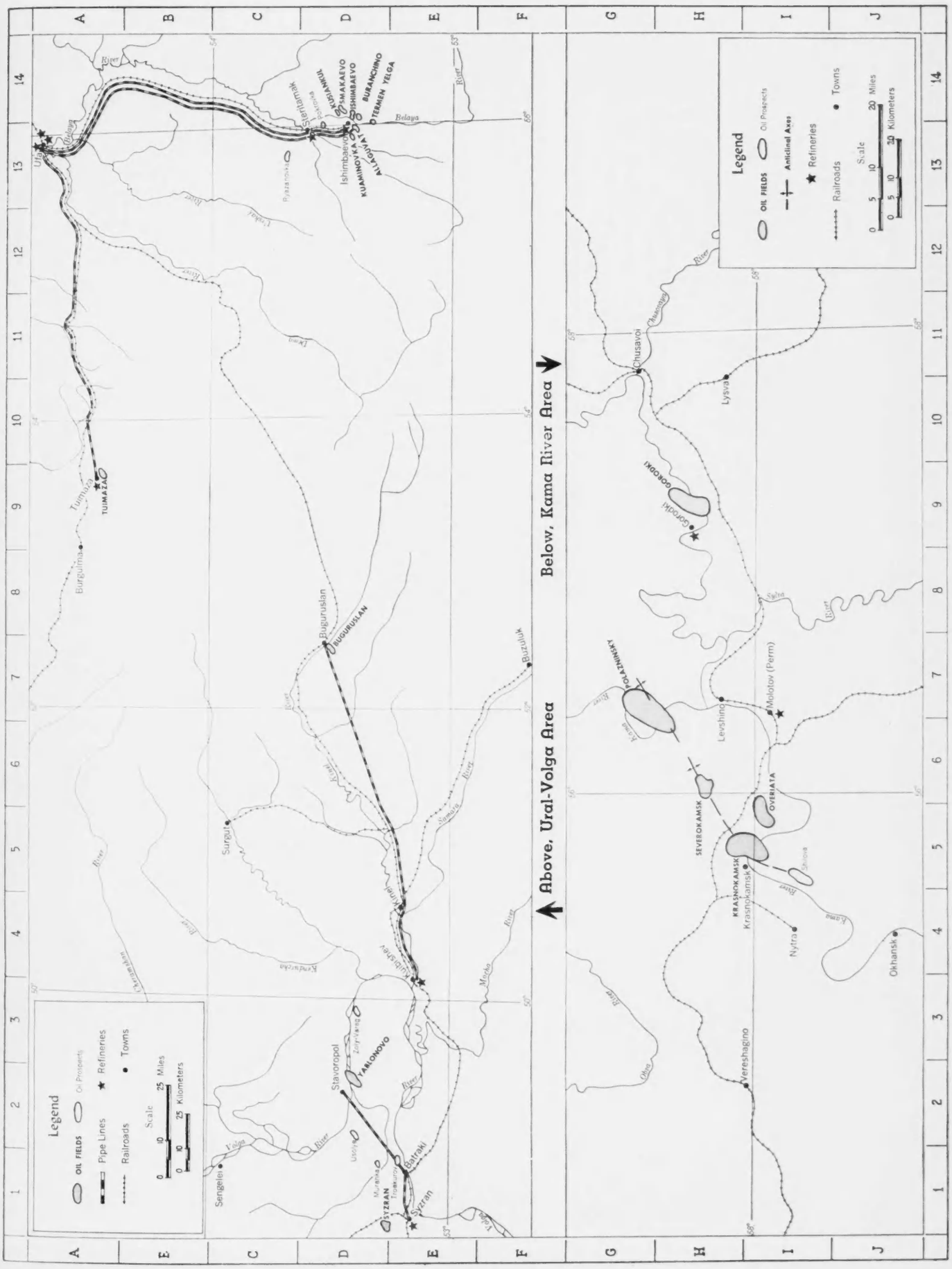
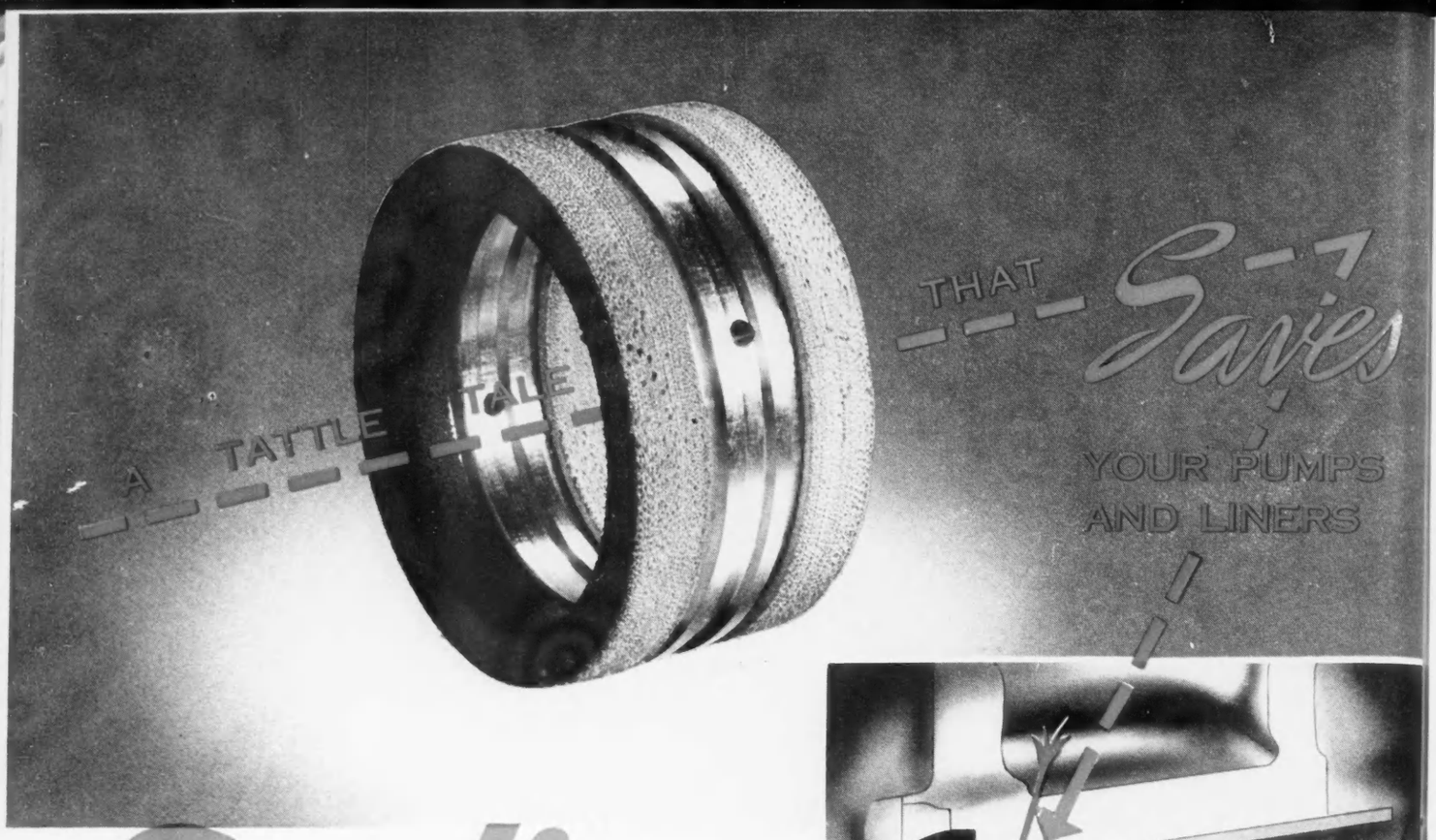
U. S. S. R.—Ural-Volga and Kama River Fields and Prospects





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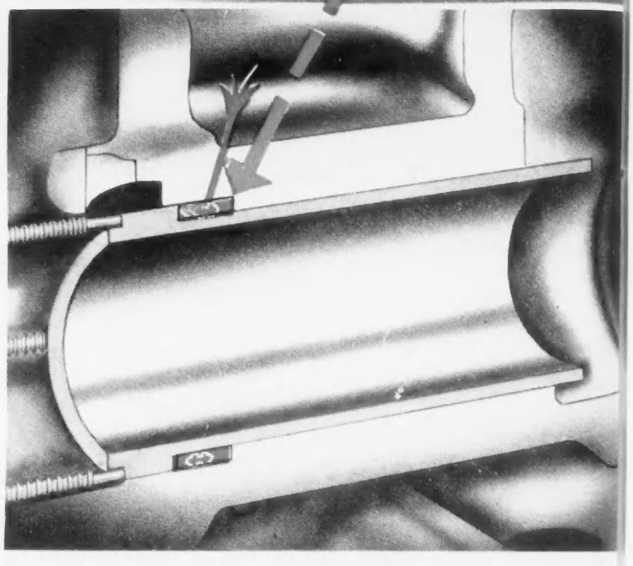


"Tattle Tale" Liner Assembly

A little "squirt" of mud tells you when the pump liner packing needs tightening or replacing. No more guessing . . . no more risking cut out liner sleeves or damaged pump housing due to packing leaks.

The "Tattle Tale" Liner Assembly consists of a grooved steel lantern ring between two hydraulic packing rings. Four holes are drilled around the circumference of the lantern ring groove, so that any fluid passing the hydraulic rings "squirts" to atmosphere through a specially drilled hole in the pump housing. That's your warning to tighten the packing, or replace the seal rings.

ADDITIONAL DEVELOPMENTS
BY STERLING ENGINEERS

The "Tattle Tale" liner assembly is but one of many packing and gasket developments by Sterling Engineers. *Spun Metallic* gaskets have the corrugations spun into the metal instead of stamping . . . preventing metal fatigue, crimping or compressing the asbestos filler. *Die-formed* metallic steam rod packings are precision shaped to accurate dimensions. Sterling style 299R, self-scaling, self-packing "V" packing rings for fluid rod seals.
Specify Sterling packing and gaskets from your supplier or ask for Sterling's engineering service to help solve special packing and gasket problems.

STERLING PACKING & GASKET CO.

(Incorporated)

Houston, Texas

U. S. S. R.—Continued

by 18 percent over 1946. This new goal represents a marked acceleration of the rate of expansion envisaged for the petroleum industry under the current Five-Year Plan.

If the Russian oil industry achieves the 1947 goal of an 18 percent boost over production in 1946, the output would total about 196,856,000 barrels, or 539,000 barrels daily. Should the rate of increase be maintained, the output in 1948 would total about 232,290,000 barrels, or 636,000 barrels, thus exceeding the prewar output of about 620,000 barrels daily, while the ultimate goal of 257,216,000 barrels set for 1950 under the Five-Year Plan would be exceeded in 1949.

This attempted speed-up of Russian oil industry's working program has been prompted by higher motor fuel requirements, especially for agriculture and road transportation, and by the shortage of coal which is wide spread throughout Europe.

Achievement of the goal set for 1947 hinges on the availability of materials and equipment which in turn depends upon the improvement in coal production. Current reports say that already the development of Russian oil fields is suffering from a shortage of pipe, both for drilling and production, while supplies of other equipment have been far from plentiful.

Oil fields in Southwest Russia, as far as Grozny, suffered considerable damage during the war and rehabilitation will be slow and require much equipment.

Meanwhile, the achievement of the 257,216,000-barrel goal set for 1950 will be modest compared with a goal of 486,822,000 barrels in 1938 and the 1942 goal of 348,768,000 barrels—neither of which was attained.

All USSR oil field operations are under government management, being handled by trusts and syndicates set up for the different producing areas. Russia's oil industry antedates that of the United States, but it was not until after 1924 that a serious attempt was made to modernize operations. Up until that time a considerable part of the country's production came from hand-dug shallow wells.

In 1946, the Praesidium of the USSR Supreme Council set up a new arrangement in reconstructing the administration of the petroleum industry in Russia. The new arrangement is a breakaway from the principle hitherto strictly observed of having the administration under a single leadership, in that it provides the splitting of this unit into two main groups.

The division sets up two All-Union Commissariats. One is the People's Commissariat for the Oil Industry of the Southern and Western European Regions—comprising the enterprises and organizations for crude oil production and refining and for oil machinery building of the Caucasus, the Ukraine and the Central Areas of the Soviet Union. The other is the People's Commissariat for the Oil Industry of the Eastern Regions—covering the same functions for the Urals, the Volga area, the Kama River area, the Far East, Kazakhstan, Uzbekistan and Turkmenia. The latter four regions are in Asiatic USSR.

Ural-Volga and Kama River Areas

The greatest concentration of effort to develop additional oil producing capacity in Russia in recent years, and especially during the war, was in the Ural-Volga and Kama River areas. Important developments have been reported in both areas, outstanding among which has been the finding of production in the Devonian formation. Production of the two areas has increased sharply.

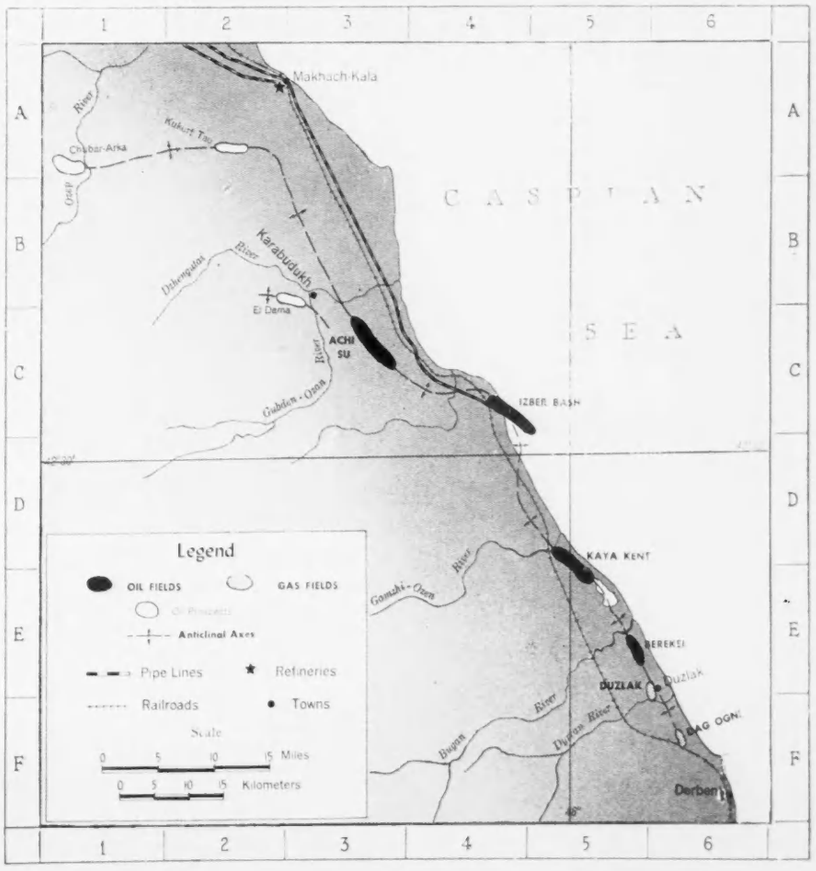
The Ural-Volga area, often referred to as the "Second Baku" region, lies in central western European Russia and extends from the Volga River on the west to the slopes of the Ural Mountains on the east. The area consists of four main producing regions; the fields around Ishimbaevo or Sterlitamak on the east, the Volga River Bend fields between Kuibishev and Syzran on the west, the Buguruslan field between Kuibishev and Ishimbaevo, and the Tuimaza (Tuimazy) field on the north.

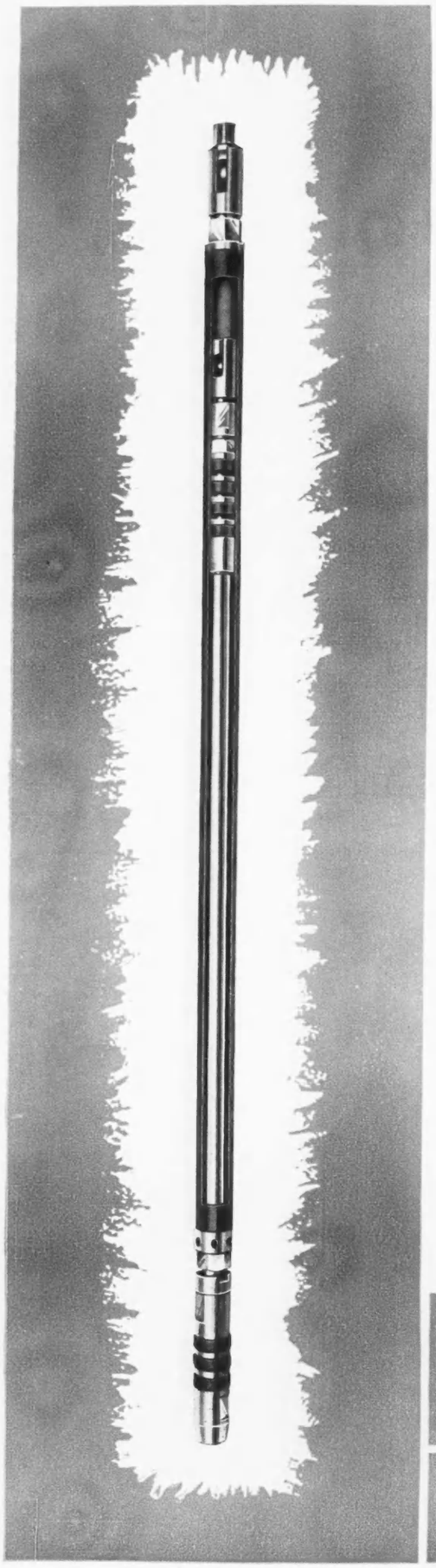
The Kama River oil district is centered around the town of Molotov, formerly called Perm, and is located approximately 300 miles north of Ishimbaevo fields of the Ural-Volga region.

First production in the Ural-Volga area was at Ishimbaevo in 1932. First production in the Kama River Basin was at Chusovskiye Gorodki in 1929, but it did not receive its first real impetus until 1935 when a well being drilled for water at Krasnokamsk found large quantities of oil.

The first Devonian formation production was discovered in the Ural-Volga region near Syzran in July, 1944. The dis-

Daghestan Fields and Prospects





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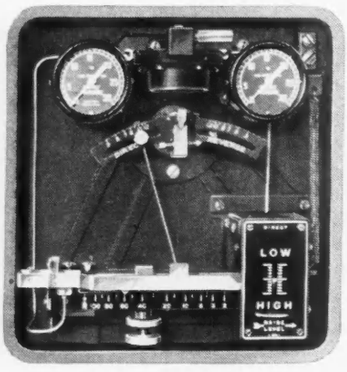
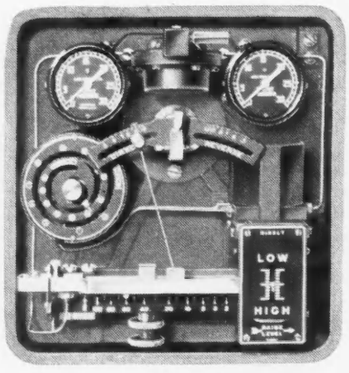
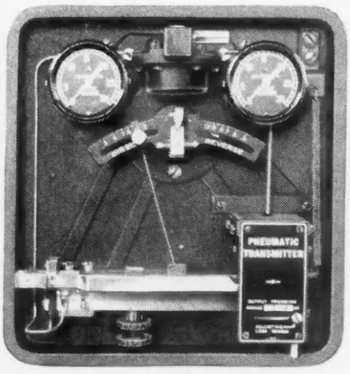


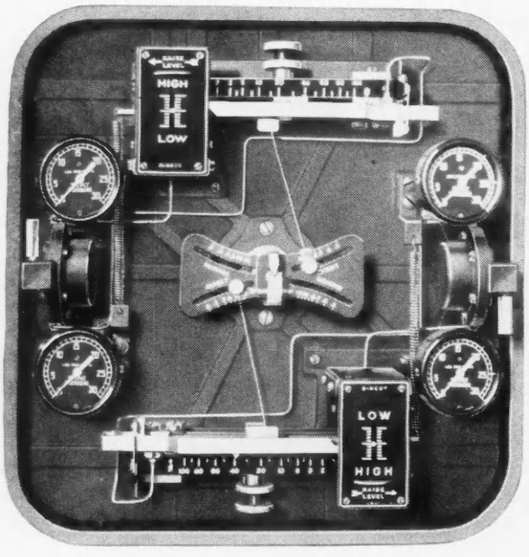
12600 Proportional Controller



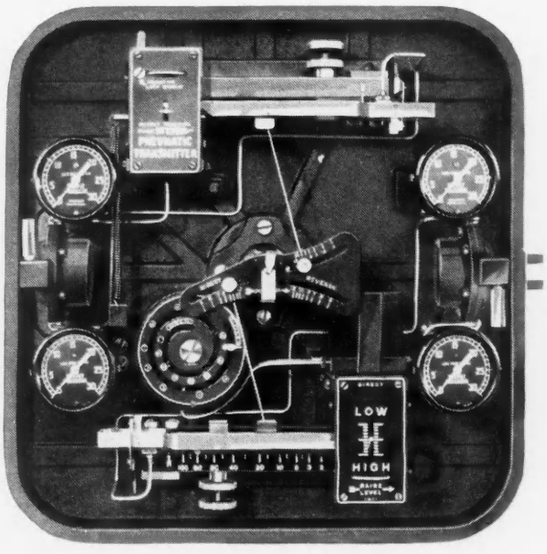
12610 Proportional-Reset Controller



12620 Pneumatic Transmitter



12600-00 Duplex Proportional Controller



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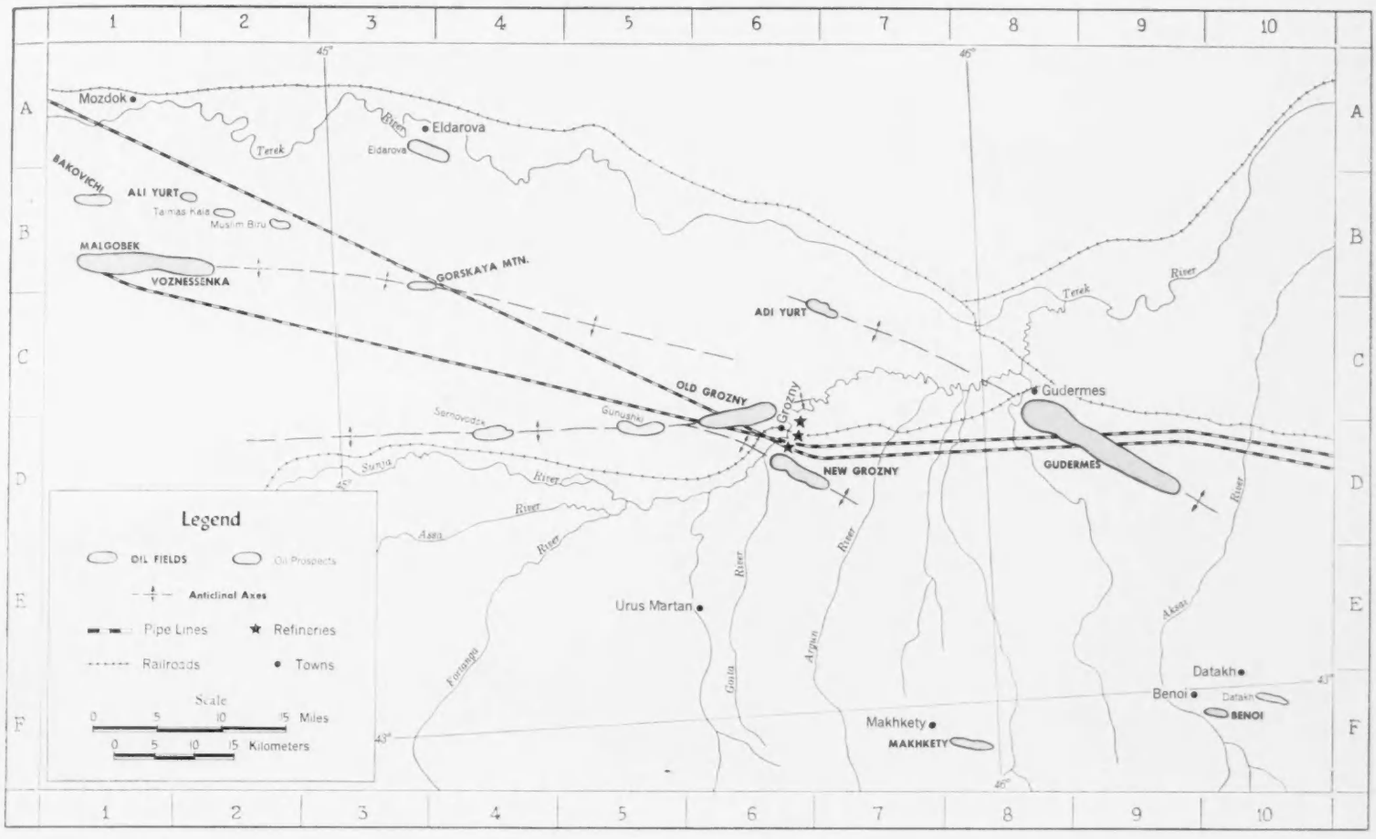
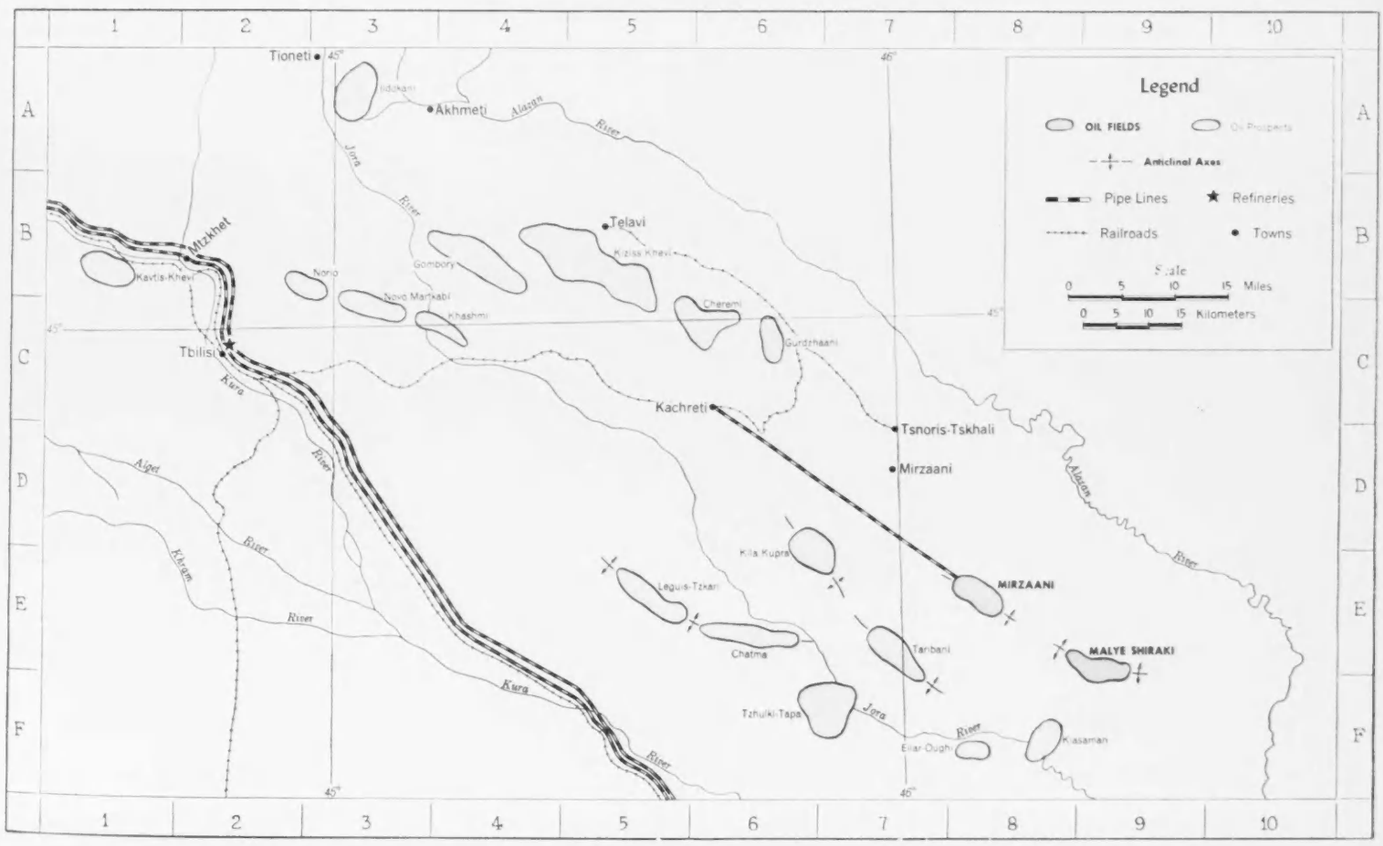


South Georgian Fields and Prospects



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covery well is credited with flowing 1400 barrels of oil daily. Later in 1944, Devonian production was established in the Tuimaza field at a depth of 9600 feet. Today a number of fields in Volga River Bend region produce from the Devonian.

Devonian production also has been discovered at Krasnokamsk in the Kama River area, and also in the Pechora district. The latter is roughly 400 miles north of the Kama fields. Thus the Devonian covers a vast area, extending more than 750 miles in a north and south direction along the western side of the Ural Mountains.

The Tuimaza field was reported to be producing about 29,000 barrels daily at the end of 1946 from 15 wells. Great things are expected of this field, since it is supposed to produce about 10 percent of the total Soviet output by 1950.

Baku-Daghestan Regions

The Baku sector, comprising the territory on the Apsheron Peninsula that projects into the Caspian Sea opposite the eastern end of the Caucasus Mountain Range, is one of the oldest and the most important oil producing regions of Soviet Russia. In 1939, the yield from the Baku fields totaled about 154 million barrels, or approximately 70 percent of the total Russian production. The oil is produced mainly from Pliocene deposits.

Output of the Baku fields, in Azerbaijan Republic declined during the war to about 80 million barrels annually. The present program under the Five-Year Plan is to increase production in this area to about 123 million barrels annually by 1950. This is to be achieved through the drilling of an estimated 2660 wells during the period as well as through the prospecting for additional high-yield pools in the Baku and adjacent Kirovobad and Kura areas. More than 400 square miles have been surveyed recently in the search for new prospects.

The latest developments in the Baku region include the adoption of marine and directional hole drilling in the Caspian Sea and the trend toward deeper drilling. Russia's deepest test for oil was completed in 1946 on Apsheron Peninsula at a reported depth of 12,800 feet. Regular producing horizons in the Baku-Daghestan fields are between 5000 and 6000 feet.

Baku also is the scene of new industrial development to keep pace with the needs of the oil fields. Huge plants are being installed to insure adequate power for the oil industry. New refineries and pipe lines are being constructed.

The Azerbaijan Republic also is becoming the site of a new oil field equipment manufacturing industry. The current Five-Year Plan calls for the construction of the republic's first pipe-rolling mill.

Two-thirds of the oil produced in the Baku fields is shipped from the port of Baku, where also are located the refineries and the new equipment manufacturing industries. The harbor covers 33 square miles and has 14 miles of coast line.

Maikop-Georgian-Grozny Areas

The Maikop-Georgian-Grozny areas are important oil producing sectors of the vast Cacasus region of Russia. Although these sectors suffered severely during the war, rehabilitation of old fields is progressing, while wildcat drilling is reported to have uncovered new oil deposits.

The Grozny area, west and north of famed Baku, produces from a series of folds paralleling the mountain range. Its anticlinal structures are complexly faulted. Production comes from the Miocene and Oligocene, principally the former.

The Maikop field was destroyed by the Russians themselves before they yielded to the German invaders, and Grozny, where the German forward thrust was finally halted, was badly damaged. Some 3000 oil wells in these sectors were damaged, depriving the Russians of about 30 million barrels of oil annually.

In Grozny, atmospheric vacuum installations which turned out about 4½ million barrels of products annually, and a cracking installation with a yearly processing capacity of 1½ million barrels were blown up during the war. Cracking plants and refineries at Odesssa, Kharkov and Krasnodar also were destroyed.

Following the war, new petroleum deposits have been reported discovered near the Suvorovskoe settlement in the Province of Grozny. One well has been completed and two new tests are drilling. Drilling also is being carried on in the desert steppe in the extreme east of Georgia. Wildcat drilling is under way at Mlashis-Khevi while geological and geophysical prospecting are being conducted at Kavtis-Khevi near the town of Gori. Drilling also has been resumed on a major scale on the Black Sea coast near Poti, Georgia's most westerly prospecting region where the first well was sunk shortly before the war.

In the Kuban-Maikop sector, a new oil center was reported opened up at Abuza, where one well yielded about 560 barrels daily. Oil residue was mined along the outcrops of the Maikop clays as early as 1870. The first gusher in the Maikop field was completed in 1909. In 1939, the Maikop fields had about 470 wells producing an average of about 85 barrels daily each.

Ukraine-Crimea Region

The Ukraine-Crimea region, which produces a very small percentage of the USSR annual crude output, suffered great damage during the war and fields left unharmed were almost depleted by German occupation.

Oil prospects of the Ukraine are not regarded as particularly promising and production development prior to the war was insignificant. Principal production is from the Romny salt dome. The present program calls for the development of the large gas resources of the Ukraine.

The principal producing area of the Crimea is the Changelek field where wells were drilled as early as 1880. Modern

U. S. S. R. Crude Oil Production

PRODUCING REGIONS	CRUDE OIL PRODUCTION (Barrels) Year 1940	Daily Average 1940	Year 1945	Daily Average 1945
EUROPE				
Caucasus:				
Baku	158,400,000	432,787	90,825,000	248,836
Grozny	37,055,000	101,243	9,445,000	25,877
Maikop			725,000	1,986
Daghestan			2,540,000	6,959
Total	195,455,000	534,030	103,535,000	283,657
Ural-Volga:				
Buguruslan	70,000	191	3,520,000	9,644
Volga Bend-Kuibyshev	2,180,000	5,956	9,080,000	24,877
Ishimbaeve-Tuimaza	10,970,000	29,973	7,265,000	19,904
Total	13,220,000	36,120	19,865,000	54,425
Kama River:	725,000	1,981	1,090,000	2,986
Emba Basin:	5,010,000	13,688	7,265,000	19,904
Ukraine and Crimea	2,905,000	7,937	2,905,000	7,959
Pechora:			715,000	1,959
EUROPEAN AREAS: Total	217,315,000	593,757	135,375,000	370,890
ASIA				
Turkmen:	4,200,000	11,475	4,720,000	12,931
Bukhara-Forgana-Termez (Uzbek-Kirgiz-Tadzik):	1,805,000	4,932	2,720,000	7,452
Sakhalin:	3,115,000	8,511	6,135,000	16,808
ASIATIC AREAS: Total	9,120,000	24,918	13,575,000	37,192
U.S.S.R. TOTAL	226,435,000	618,675	148,950,000	408,082

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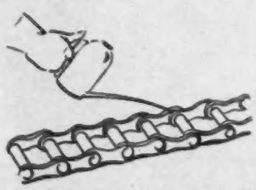
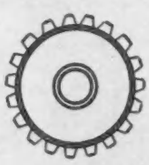
Just because Jeffrey oil well chains are tough and rugged, don't abuse them. Care saves wear.



USE LIGHT OIL and OIL FREQUENTLY. Don't swab Jeffrey chains with heavy grease or dirty oil.

TAKE OFF AND CLEAN with COAL OIL. Remove heavy grease, grit and dirt before reinstalling.



REVERSE SPROCKETS if possible, or REPLACE with NEW ONES. Worn sprockets cause excessive wear. Switch them frequently. Never run a new chain on worn sprockets. Be sure sprockets are in line.

NEVER LAY IN DIRT OR SAND. Don't throw chain on the ground, or at least clean thoroughly before replacing.

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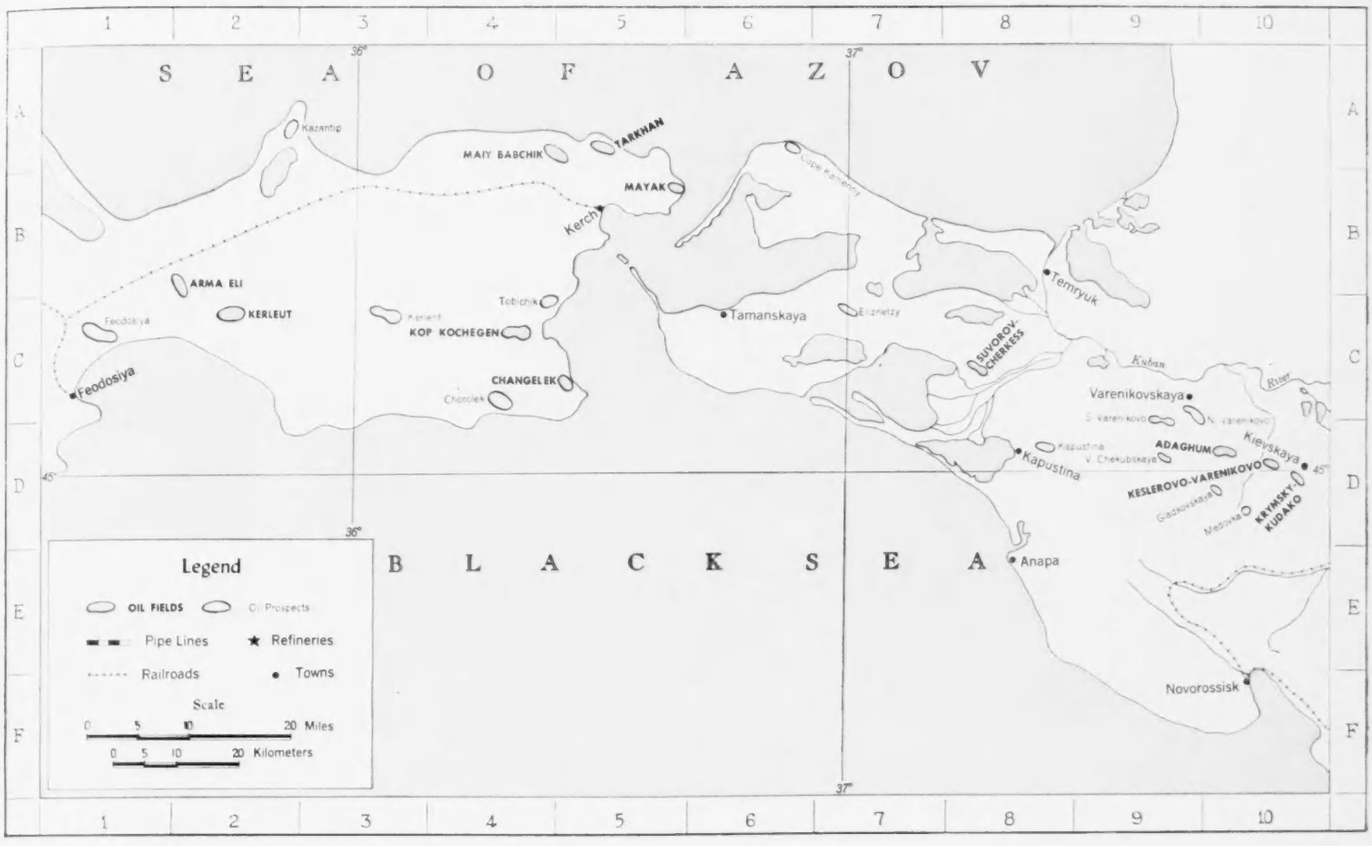
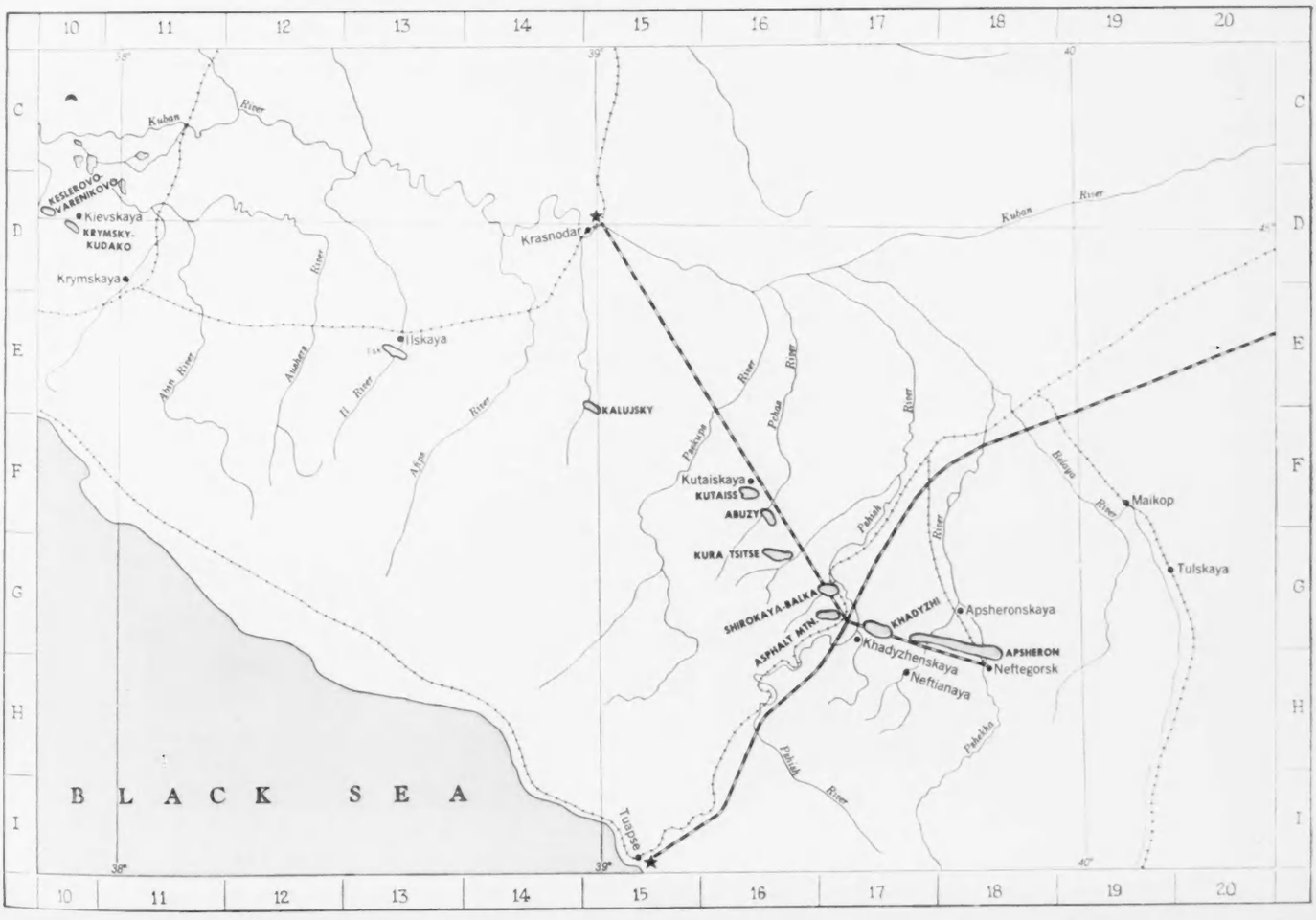
U. S. S. R.—Crimea and Kuban-Maikop Fields and Prospects



Southeastern Continuation of Above Map, Same Scale



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See pages 3173-3192 of the
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drilling was not undertaken until comparatively recently and the field was in the early stages of development prior to the war.

Russia has also taken over from Poland the oil fields of eastern Galicia. These Polish fields which formerly produced 63 percent of Poland's oil are now part of the Ukraine Province. In 1939, production was about 2½ million barrels, but dropped to about 1½ million barrels during German occupation. Soviet plans are to restore the districts to its prewar production by 1950. Reports indicate that 16 wells are producing at Bitkov, oldest Sub-Carpathian field.

Emba Basin Region

The Emba oil fields spread from the shores of the Caspian Sea northward to the southern foothills of the Ural Mountains. The fields are located in western Kazakh Republic where oil was first discovered more than 100 years ago. Emba crude is characterized by an extremely low sulphur content and, therefore, yields first-grade lubricating oils and aviation gasoline.

Oil production from the Emba region totalled an estimated 5½ million barrels in 1946 and compares with the last prewar output of about 4½ million barrels annually. The planned output for the area is expected to reach 8½ million barrels in 1950.

Most of the oil in the Emba region is found in Jurassic sediments. There is also some Cretaceous production and a prolific deep Permo-Triassic horizon. Most of the fields are associated with salt domes, of which there are at least 100 in the area. Production comes from sands on the flanks and caps of these salt masses, and the general structural picture is similar to that on the Texas and Louisiana Gulf Coast.

Pechora Region

The Pechora region lies along the Arctic Circle in the Komi Republic, European USSR, and contains exposures of Palezoic rocks (Permian, Carboniferous and Devonian). The oil fields and prospects are situated along the south extension of the Timan and Kozhva ridges.

Devonian production was obtained in the Ukhta field as early as 1939. Little information is available as to the production from the Pechora fields but the output in 1942 was estimated at about 1½ million barrels.

Asiatic Fields

On the eastern shore of the Caspian Sea, opposite the Baku fields, lies the Turkmen fields. Further inland, in south Central Asia, is the Uzbek-Tadzhik-Kirghz (Fergana) producing area, while on the Pacific Ocean side of Asia, there is the Sakhalin Island production.

The Nebit-Dag fields comprise the principal producing sector of Turkmen. Daily production in 1945 was estimated at 13,650 barrels, compared with 665 barrels in 1933. The number of wells, in 1933, was eight, and in 1945 had been increased to 146. Nebit-Dag's oil possibilities are said to have been known in the nineteenth century with the first well drilled there in 1882, but in 1931 a gusher-type producer was completed to establish first commercial flow.

The oil fields and prospects of Fergana area located around that city and lie along folds in Tertiary and Cretaceous rocks which generally strike in an east-west direction. Production in 1941 was estimated at 3½ million barrels with the daily average flow of the wells being about 2000 barrels each.

In eastern Asia oil has been reported discovered on Kamchatka Peninsula, 600 miles northeast of Sakhalin.

The presence of oil seeps and asphalt deposits along the northeastern side of Sakhalin led to exploration for oil in 1880, but up to 1904 the production was negligible. By 1923, the Okha pool near the northern tip of the island was proved to be of commercial importance. There are 8 or 9 producing sands in the Sakhalin fields lying between depths of 45 and 930 feet. Russian cumulative production from Sakhalin is reported to have been about 3 million barrels up to January 1, 1940. Production in 1941 was reported to be about 3½ million barrels with a steady increase ever since.

Pipe Lines and Refineries

The largest pipe line project yet completed in Russia is the 500-mile 12¾-inch natural gas carrier from the Saratov gas fields on the Volga River to Moscow. The Saratov gas reserves were discovered during the war and the field has since been developed into a major producing area. Gas is being delivered to Moscow through the line at an estimated rate of 45 million cubic feet daily. The line was completed in 1946.

Another natural gas pipe line is projected between Daszawa (Poland) and Kiev in the Soviet Ukraine. The line will be about 325 miles long and will have an ultimate capacity of 177 million cubic feet daily. A natural gas and crude line is being built from Estonia shale areas to Leningrad.

During the war a 125-mile gas pipe line was built from Pokhvistnevo to Kuibishev. Reported nearing completion is a 20-mile gas line connecting Pokhvistnevo with a recently discovered gas deposit near Yabolonovo. A 15-mile natural gas carrier has been built from the Terek River to Gronzy.

Also reported as in the construction program is a crude oil line from the Tuimaza fields to the Ufa refineries in the Ural area. Soviet plans also call for the construction of a network of crude oil lines from Balkan producing areas to Ukrainian refining centers. Already constructed is a crude

Engineering and Geological Data on U. S. S. R. Asiatic Fields

AREA AND FIELD	Discovery Year	Gravity of Oil (API)	PRODUCING FORMATION		
			Age	Depth (Feet)	Type Structure
Eastern Siberia Region:					
Ust Maya	1944				
Sakhalin Island:					
Elkhabi			Upper Pliocene	310— 630	Anticline
Katangli			Upper Pliocene	2460	Anticline
Nutovo			Upper Pliocene	260— 2885	Anticline
Okha	1889	15–26	Upper Pliocene	300— 775	Anticline
Polomai			M. & L. Pliocene	8858	Anticline
Vigrek			Upper Pliocene	120— 220	Anticline
Turkmen Area:					
Cheklishlyar	1939		Middle Pliocene		
Cheleken	1904		Pliocene	820	Faulted Dome
Nebit-Dag			Middle Pliocene		Anticline
Neftedag	1931		U. & M. Pliocene		Anticline
Uzbek-Kazakh-Tadzik (Fergana) Area:					
Ak-Mecket	1940		Eocene		Anticline
Andizhan	1938				Anticline
Barzik					Anticline
Changirtash	1932				Anticline
Chimmon	1920	29	Eocene	1000	Anticline
Chu	1943				Anticline
Dzhar-Kurgan					Anticline
Eneunimsai					Anticline
Eno-Sing					Anticline
Kamishbashi					Anticline
Kanabad-Sai	1939				Anticline
Kandag	1934		Oligocene	528	Anticline
Kim (Sel Kokho)	1909	29	Eocene		Anticline
Komosol	1943				Anticline
Kulmen					Anticline
Mailsai	1903				Anticline
Melnikovo					Anticline
Namangan					Anticline
Nefteabad	1936				Anticline
Pavlan Tash	1939				Anticline
Pitausa					Anticline
Ristansanto					Anticline
Shor-Su (Kagnovich)	1931	30	Eocene	650	Anticline
Tekebel					Anticline
Ueh Kyzyl (Termez)	1936				

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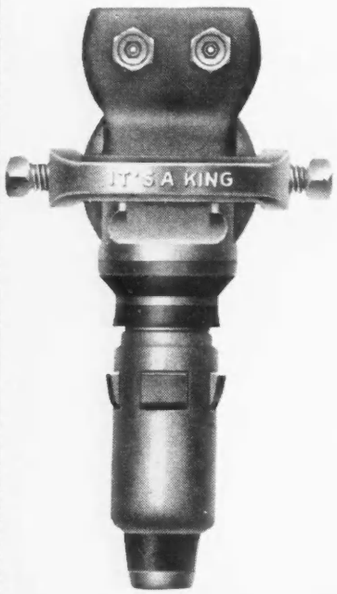
The 4AR Type is used mainly in wire line coring and 3AR Type is usually used for swabbing.



AR Line Stripper

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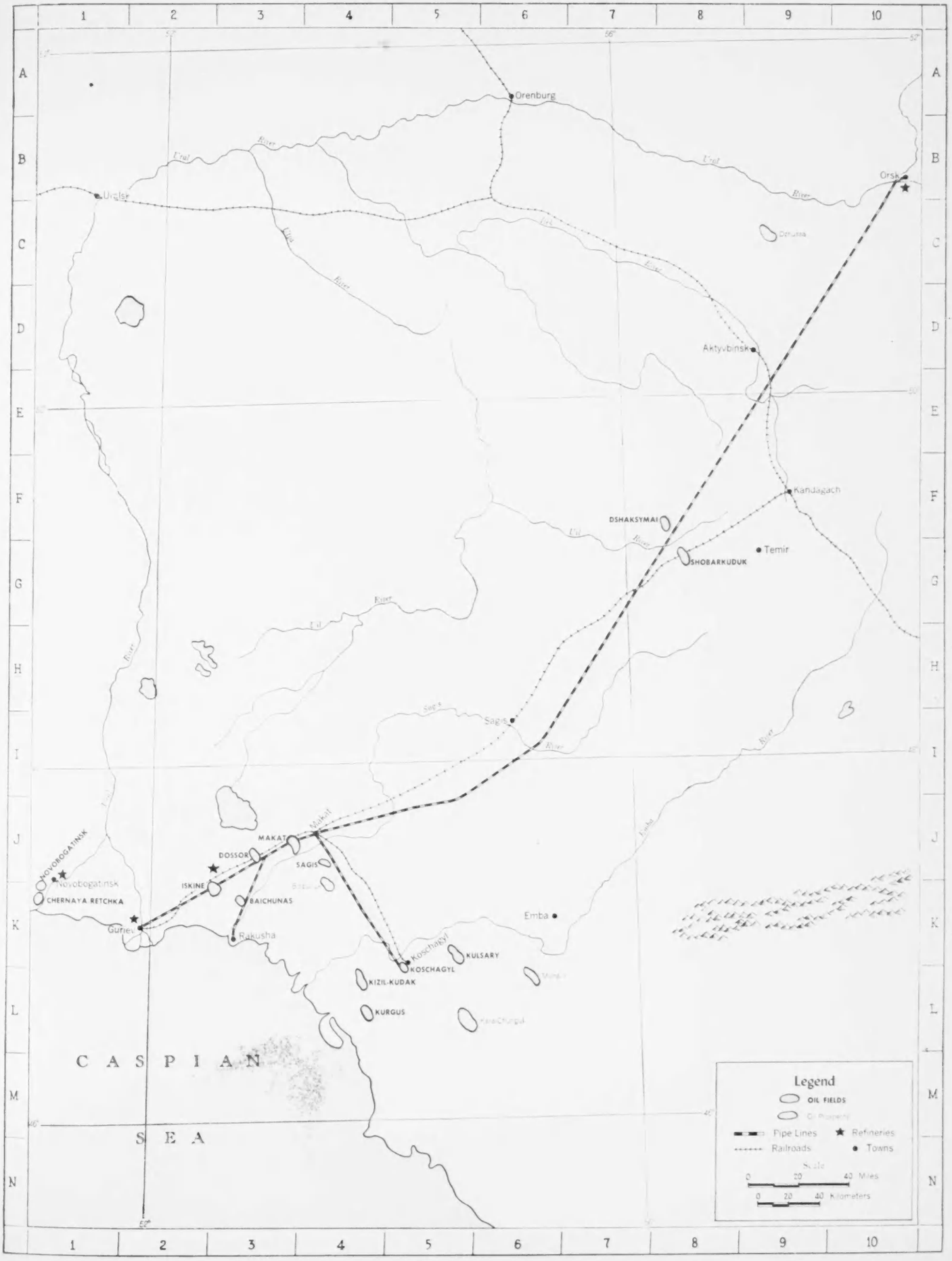
U. S. S. R.— Emba Basin Fields and Prospects



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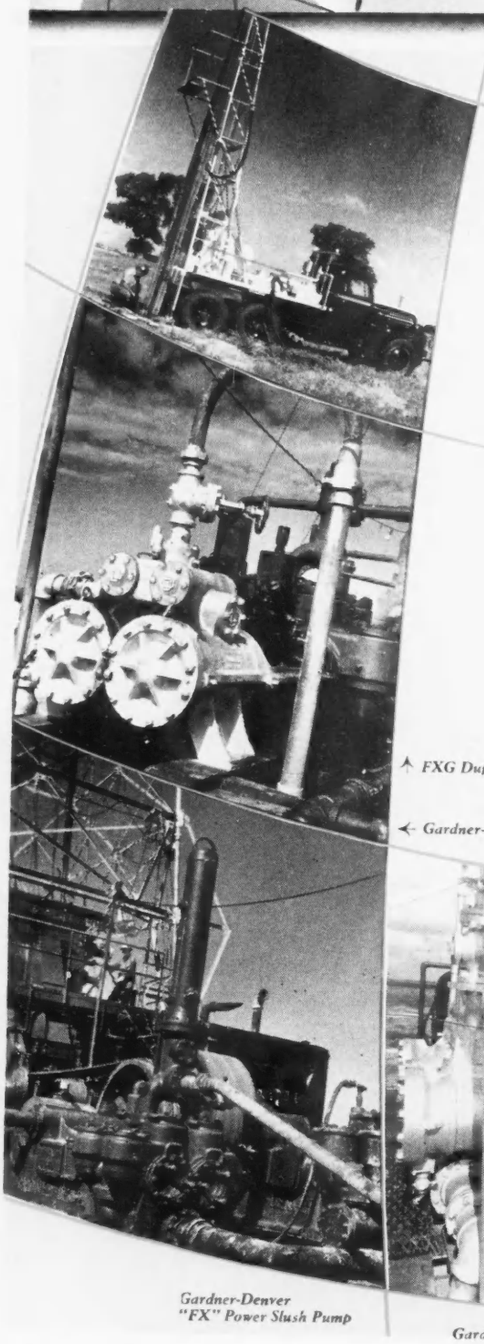
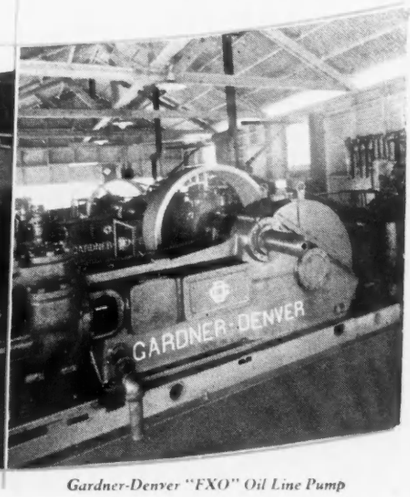


Gardner-Denver "FX" Power Slush Pump

FXG Duplex Power Pump for geophysical and seismograph work

Gardner-Denver 18x8x20 Steam Slush Pump

Gardner-Denver 14x14 Steam Drilling Engine



Gardner-Denver "FXO" Oil Line Pump

line from the Ploesti fields in Roumania that makes this oil available to the Odessa refinery on the Black Sea.

Exclusive of natural gas lines, the principal USSR trunk pipe lines total almost 4000 miles.

Laying of the new gas lines is a part of the Russian program to expand all phases of the natural gas industry, including the processing of coal, peat and shale. It is planned to develop an annual output of more than 296 billion cubic feet of natural gas by 1950.

By 1950 Russia plans to rebuild Estonian and Leningrad Province shale mines with annual capacities of 9.4 million tons and 3 million tons, respectively. By 1950 the output of gas from shale and coal is expected to jump to more than 18 trillion cubic feet. To accomplish this the Russians are building shale gas and shale processing plants in a number of districts, particularly Kokhtla-Yarve, Akhtme and Kivyilli in Estonia.

Other than at Estonia and Leningrad, shale deposits in the Soviet Union are located at Gorki, Chelyabinsk, Saratov, Ukhta, and in the Urals and Komi Republic of European Russia, and in Fergana Valley and Lake Baikal areas, Asia.

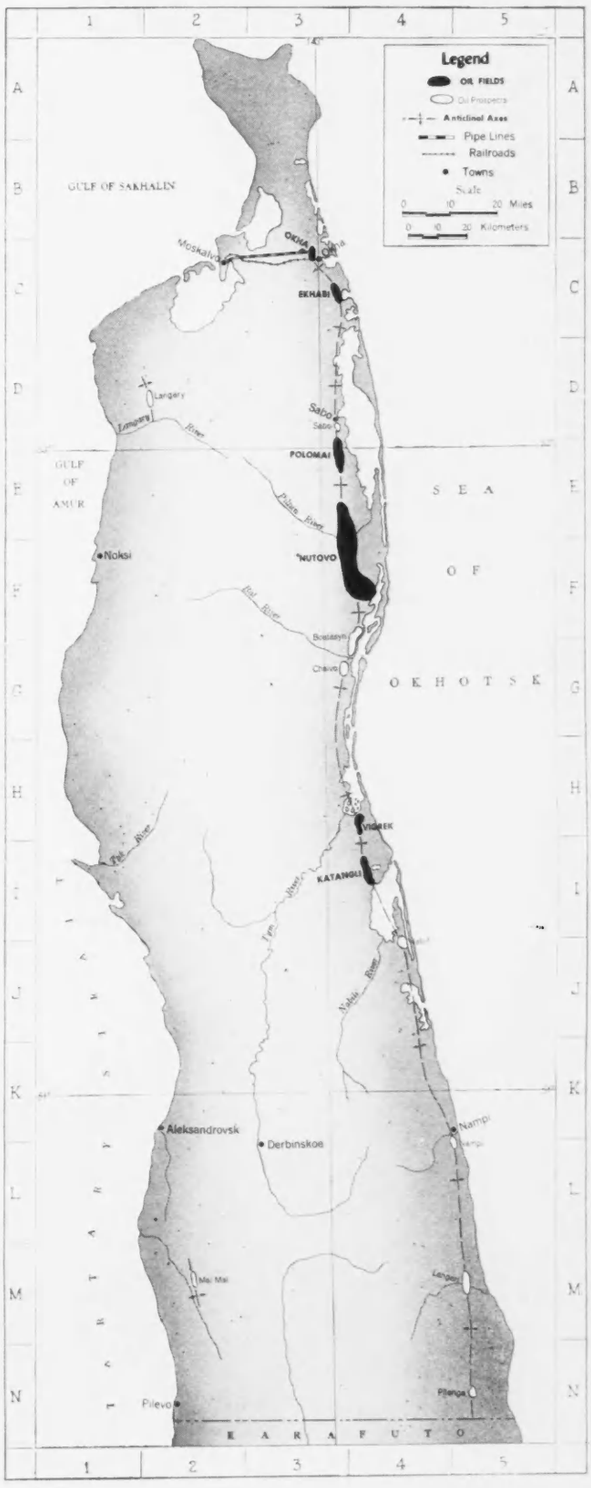
Soviet reports say that the largest Russian oil refinery is being built between Kuibishev and Omsk, one of the oil centers of the "Second Baku." A large refinery is being constructed at Nebit-Dag in the rich oil region of Turkmen. The construction of the first refinery in Kazakh Republic began in 1945, and a number of units are operating. Expansion of plants in the Baku and Ural Volga regions is reported. The Five Year Plan calls for the building of four oil refineries and 16 oil refining installations.

Data on U. S. S. R. Refineries

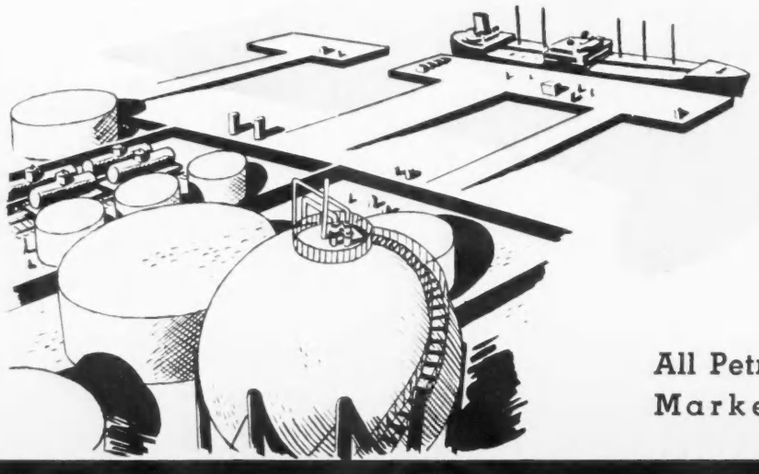
LOCATION	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
European Refineries:				
Baku (5 Refineries)	375,000	50,000	Skim-Crk	Operating
Batumi	2,000		Skim.	Operating
Berdyansk	.....	5,000	Crk.	Operating
Boulova	.....	.....		Unknown
Buguruslan	.....	.....		Operating
Chelyabinsk	.....	.....		Operating
C. Gorodki	28,000	5,000	Skim-Crk.	Unknown?
Drohobyez[1] (4 refineries)	3,000	1,000	Complete	Rebuilding
Gleboka (Sambor)[1]	100	.....	Skim.	Rebuilding
Gorki	.....	10,000	Cracking	Operating
Grozny (3 Refineries)	150,000	50,000	Skim-Crk.	Operating
Gurev	1,000	.....	Skim.	Operating
Ishimbaevo	9,000	.....	Topping	Operating
Iskine	.....	.....	Topping	Unknown
Kazan	.....	.....		Unknown
Kherson	.....	5,000	Cracking	Operating
Krasnodar (Maikop)	25,000	.....	Skimming	Rebuilding
Kuibyshev	.....	.....		Operating
Leningrad	.....	5,000	Cracking	Destroyed
Makhach Kala	2,000	.....	Skimming	Operating
Molotov (Perm) (2 Refineries)	12,000	4,000	Skim-Crk.	Operating
Moscow	.....	12,800	Cracking	Operating
Munkaes[2]	420	.....	Skimming	Unknown
Nadworna[1]	200	.....	Skimming	Unknown
Nebit Dag	.....	.....		Building
Nikolaev	.....	.....		Unknown
Novobogatinsk	500	.....	Skim.	Operating
Odessa	.....	5,000	Cracking	Operating
Orsk	28,000	5,000	Skim-Crk.	Operating
Saratov	.....	35,000	Cracking	Operating
Sernovo	.....	.....		Operating
Stalingrad	.....	.....		Rebuilding
Sterlitamak	15,000	.....	Skimming	Operating
Stryj[1]	250	.....	Skimming	Unknown
Syzran	.....	.....		Operating
Tbilisi (Tiflis)	.....	.....		Operating
Tuapse	35,000	10,000	Skim-Crk.	Rebuilding
Tumaza	.....	.....		Operating
Ufa	28,000	5,000	Skim-Crk.	Operating
Ukhta	.....	.....	Topping	Operating
Ustrzyki Dolna[1]	1,000	.....	Skimming	Unknown
Yaroslavl	9,000	4,000	Skim-Crk.	Operating
Znesienie (Lwow)[1]	1,000	.....	Skim-Lube	Unknown
Asiatic Refineries:				
Fergana (4 Refineries)	40,000	10,000	Skim-Crk.	Operating
Irkutsk	.....	.....		Operating
Khabarovsk	4,500	3,500	Skim-Crk.	Operating
Komsomolsk	4,500	3,500	Skim-Crk.	Operating
Krasnovodsk	4,000	3,000	Skim-Crk.	Operating
Krasnoyarsk	.....	.....		Operating
Moskalvo	.....	.....	Topping	Operating
Nikolaevsk	4,500	3,500	Skim-Crk.	Operating
Vladivostok	.....	.....		Operating

[1] Refineries located in former Polish territory.
[2] Refinery located in former Czechoslovakian territory.

Sakhalin Fields and Prospects



Anchor's Away
OUT FRONT



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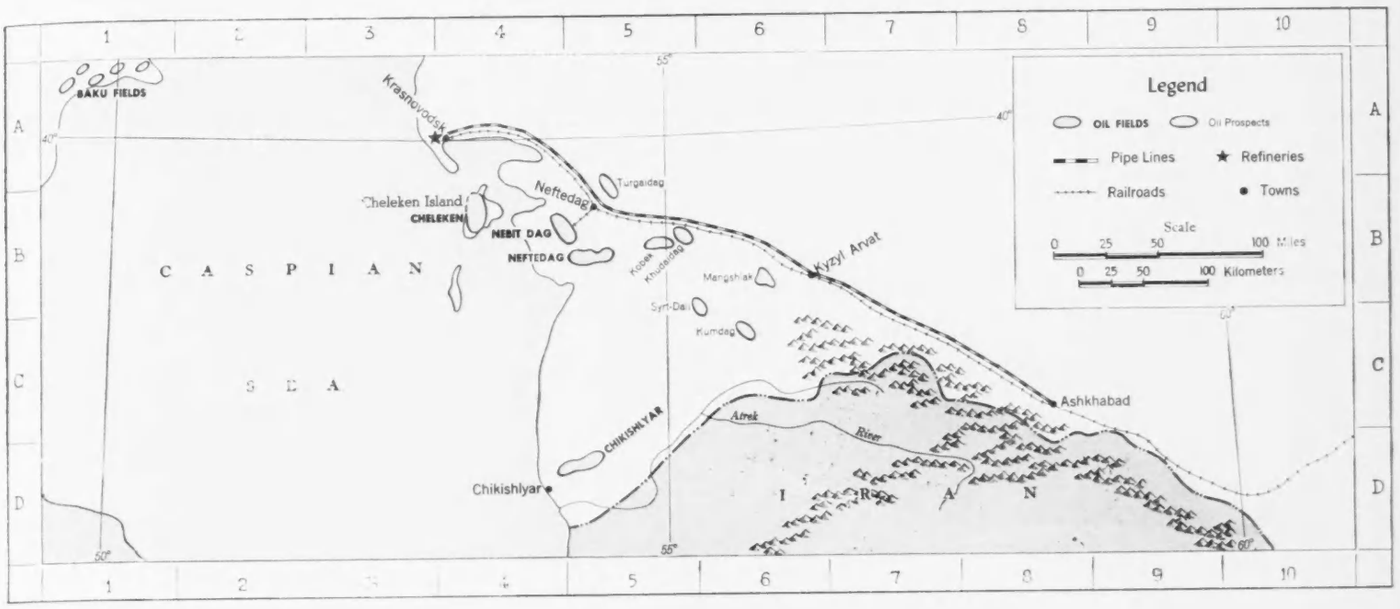
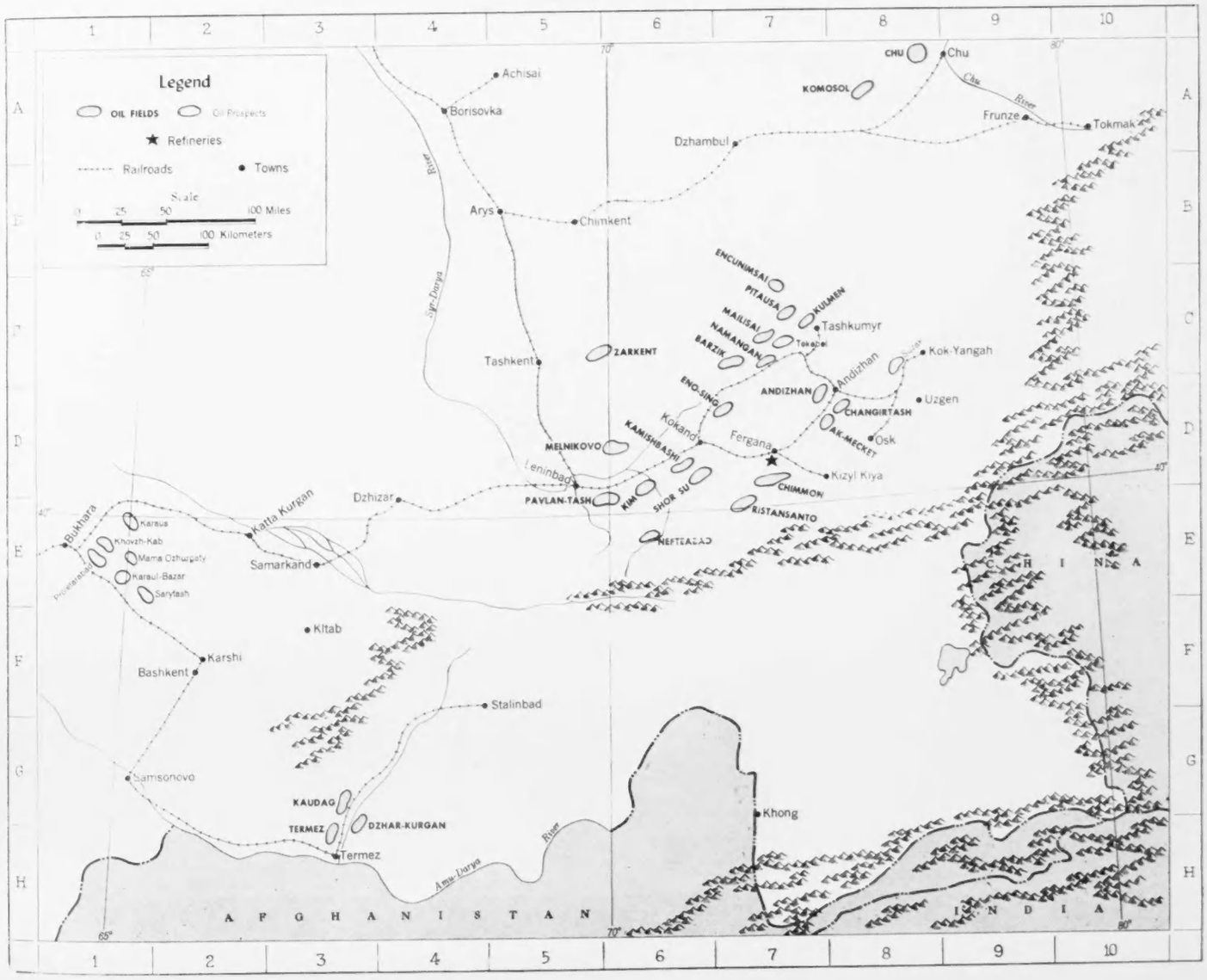
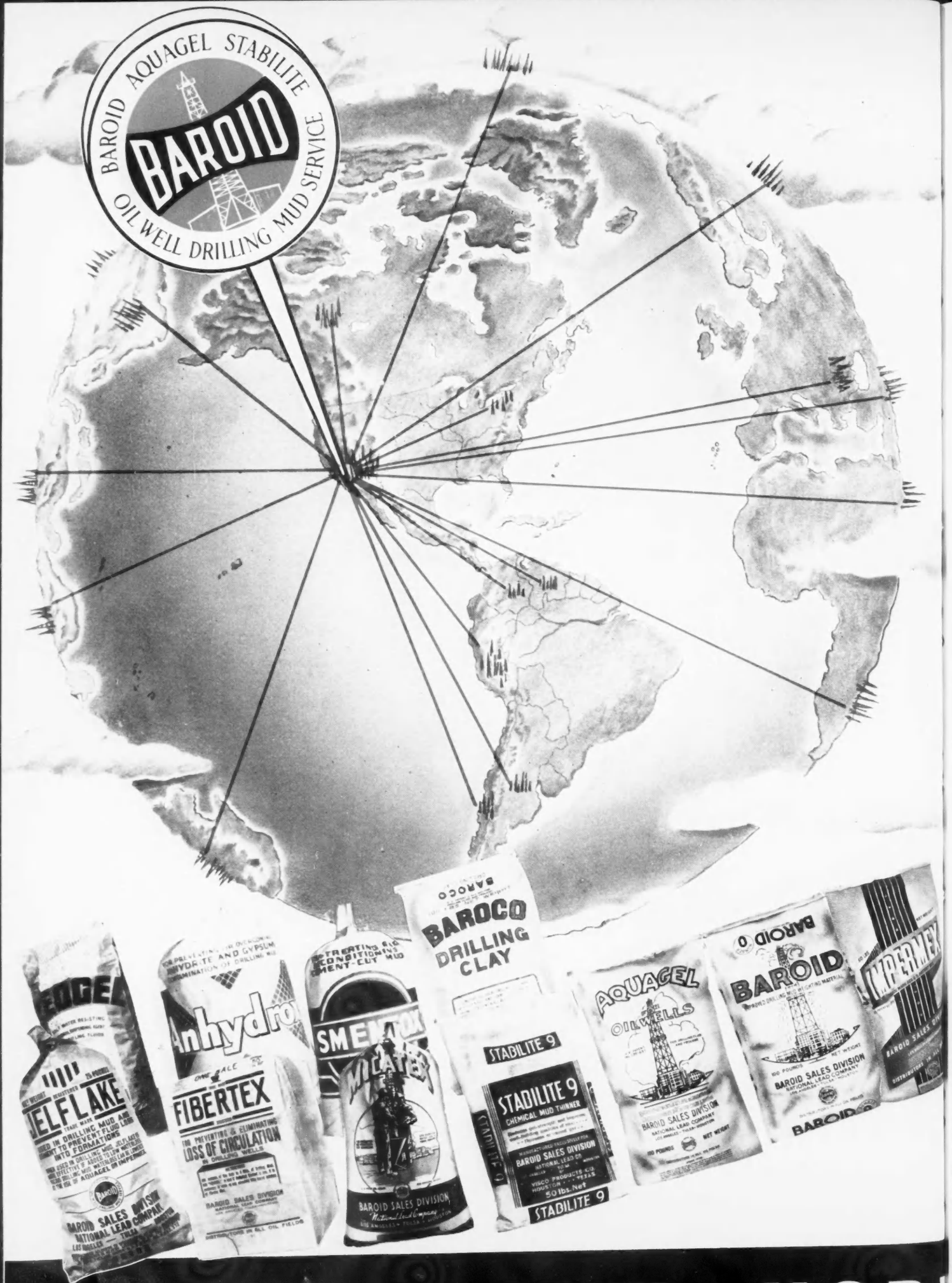
U. S. S. R.—Turkmen Fields and Prospects



Uzbek-Tadzik-Kirgiz Fields and Prospects





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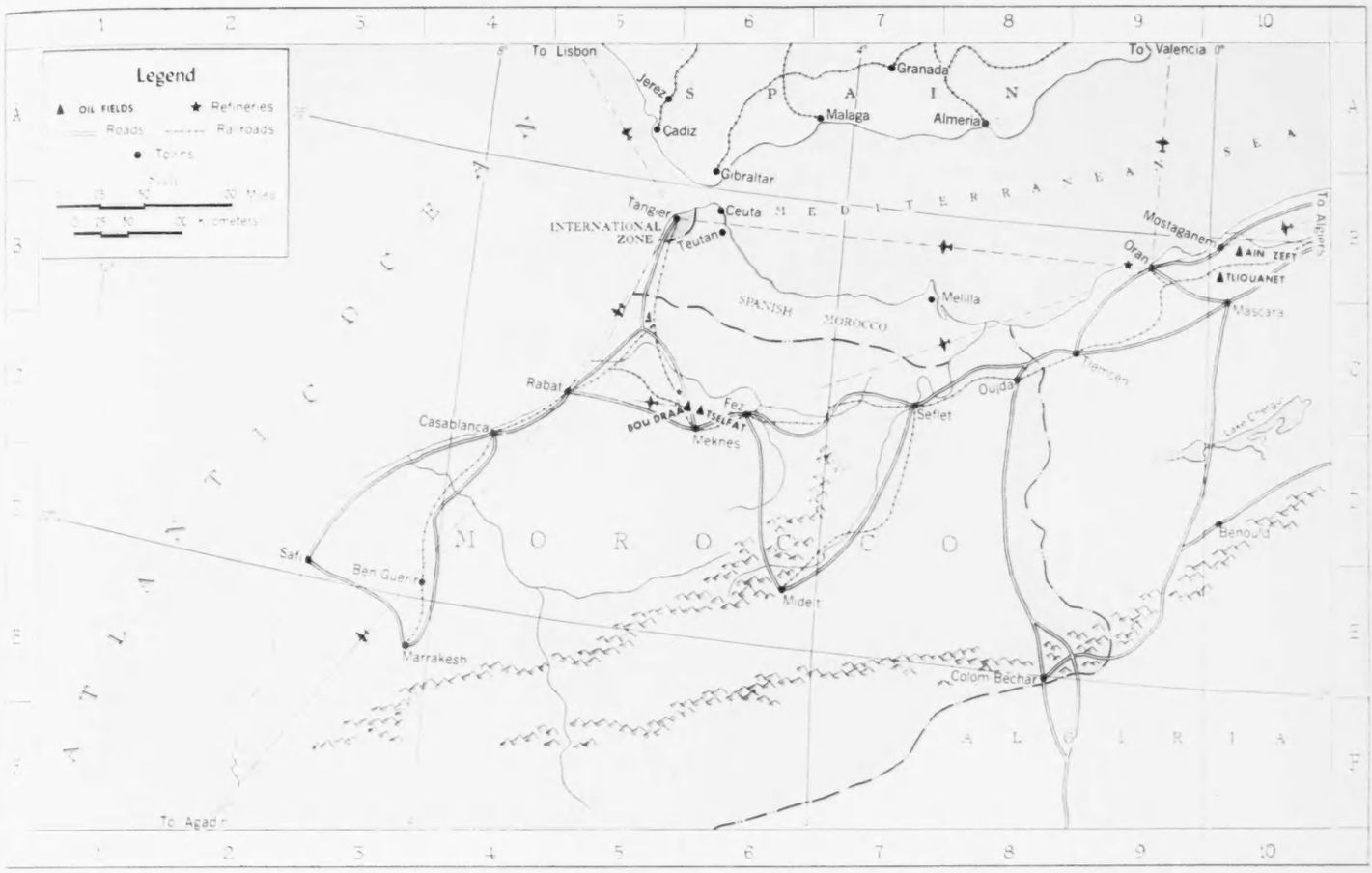
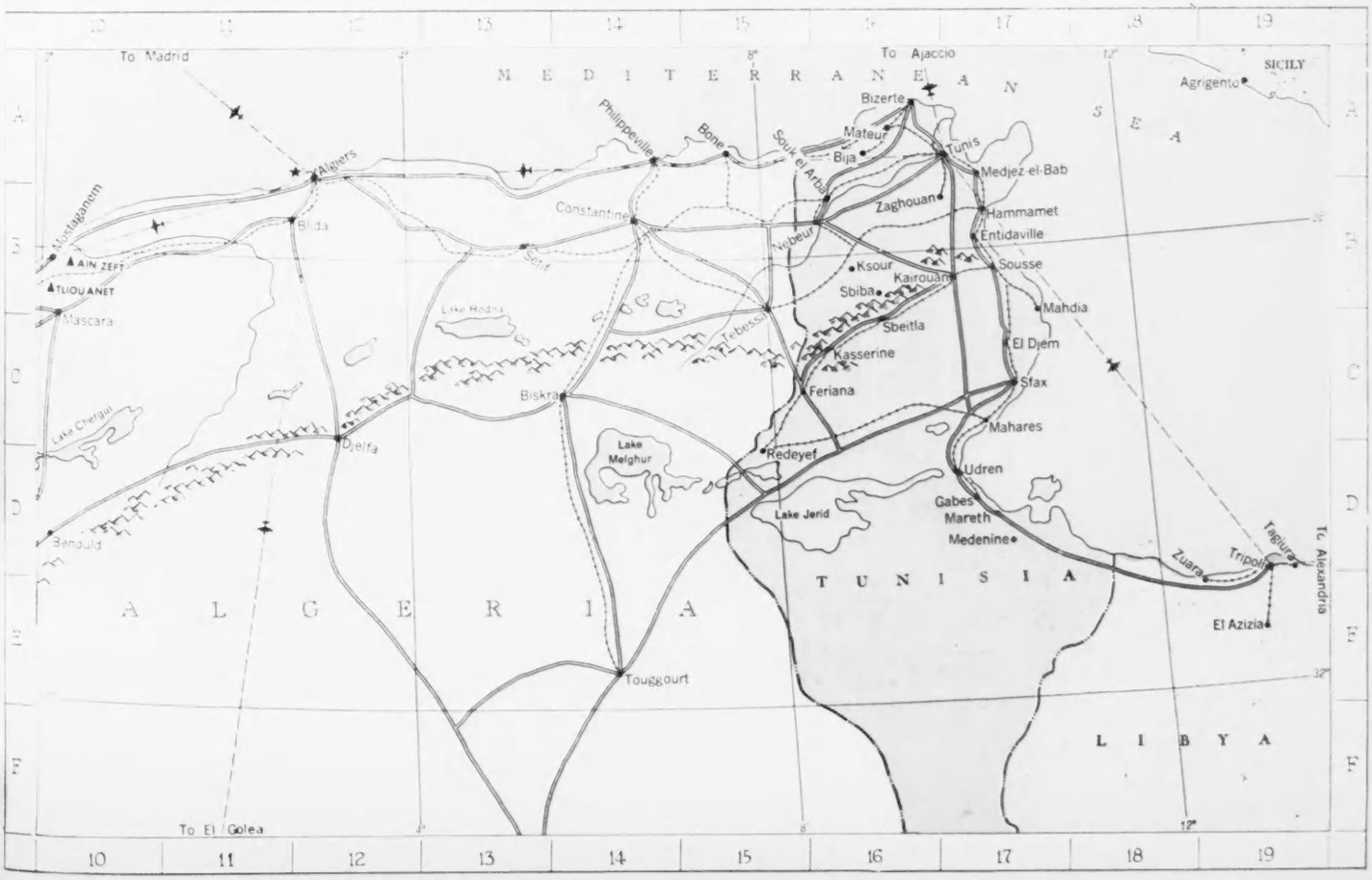
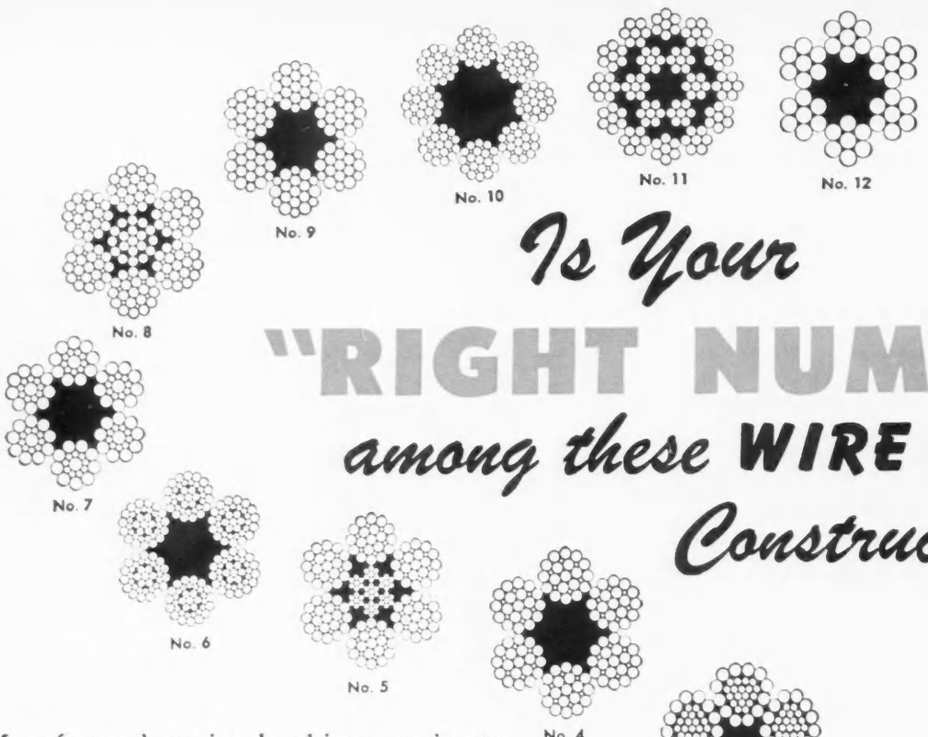


Eastward Continuation of Above Map





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No. 6—6 x 37 Round Strand—Hemp Center
No. 7—6 x 19 Seale Round Strand—Hemp Center
No. 8—6 x 19 Round Strand—Metallic Core
No. 9—6 x 19 Warrington Round Strand—Hemp Center
No. 10—8 x 19 Filler Wire Round Strand—Hemp Center
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ALGERIA, MOROCCO and TUNISIA

AN AGGRESSIVE wildcat program is being mapped by French interests in Algeria, Morocco and Tunisia. Production from small fields in Morocco and Algeria has steadily declined during the past several years. Algeria's only production is from five wells in the Thiouanet field in the Dhara region of the Oran district. Activity in 1946 was confined mostly to geological tests.

Production from Morocco's three oil fields—Tselfat, Ain Hamra and Bou Draa—amounted to 19,700 barrels, a drop from the 23,603 barrels produced in 1945, although drilling was maintained at the 1945 level. During the year 19 tests, including 16 dry wildcats and three oil producers in the Ain Hamra field, were completed. Total footage was 42,890 feet as compared with 27,630 feet in 1945. The exploration program in the Rharb basin of Morocco by Societe Cherifienne des Petroles, the operating company, will be increased through the purchase of new U. S. equipment.

Since 1931 in Tunisia Syndicat d'Etudes et de Recherches Petrolieres, which owns the concession, has drilled 11 wildcats, totaling 34,440 feet, on seven different structures but all were failures. The company has ordered from the U. S. two rotary rigs capable of drilling 10,000 feet. The deepest test yet drilled in Tunisia was on the Ain Rhelal structure in the Ferryville area, abandoned at 9184 feet.

Refineries are located at Thiouanet in Algeria and at Petitjean in Morocco. The latter, with capacity of 700 barrels daily, during 1946 had crude runs totaling 27,500 barrels. The Thiouanet plant has a capacity of about 50 barrels daily and is operated by Service des Recherches Minieres. The French government's small plant at Azrew, 25 miles east of Oran, is shut down.

Producing Wells and Oil Production of Morocco

Territory and Field	Oil Wells at End of 1946: Producing: Year of Discovery	Art. Lift	Total Producing	Crude Oil Production (Barrels): Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
Port Lyautey:							
Tselfat	1934	23	23	11	5703	4500	121,000
Ain Hamra	1918	30	30	18.5	8600	8200	45,000
Bou Draa	1936	27	27	10	9300	7000	151,000
Totals		80	80	39.5	23,603	19,700	317,000

Wildcats Completed in Morocco in 1945 and 1946

Territory	Company and Well	Date Completed	Total Depth (Feet)	Results
Port Lyautey.	Societe Cherifienne des Petroles' Tselfat Nord 1	10-45	3380	Dry in Toarcian
Port Lyautey.	Societe Cherifienne des Petroles' Tselfat Nord 2	2-46	1640	Dry in Jurassic
Port Lyautey.	Societe Cherifienne des Petroles' Tselfat Nord 3	7-46	3710	Dry in Toarcian
Port Lyautey.	Societe Cherifienne des Petroles' Tselfat Nord 4	5-46	1480	Dry in Jurassic
Port Lyautey.	Societe Cherifienne des Petroles' Tselfat Nord 5	7-46	1940	Dry in Helvetian
Port Lyautey.	Societe Cherifienne des Petroles' Bab Tiouka 1	1-46	3360	Dry in Cretaceous
Port Lyautey.	Societe Cherifienne des Petroles' Bou Draa North 127	2-45	1780	Dry in Toarcian
Port Lyautey.	Societe Cherifienne des Petroles' Bou Draa North 118	3-45	210	Shut down for lack of materials
Port Lyautey.	Societe Cherifienne des Petroles' Bou Draa North 128	2-45	2400	Dry in Toarcian
Port Lyautey.	Societe Cherifienne des Petroles' Fokra 2	9-45	950	Dry in Cretaceous
Port Lyautey.	Societe Cherifienne des Petroles' Fokra 3	10-45	1510	Dry in Eocene
Port Lyautey.	Societe Cherifienne des Petroles' Fokra 4	12-45	1670	Dry in Oligocene
Port Lyautey.	Societe Cherifienne des Petroles' Fokra 5	3-46	1980	Dry in Tortonian
Port Lyautey.	Societe Cherifienne des Petroles' Fokra 7	7-46	1850	Dry in Bartonian
Port Lyautey.	Societe Cherifienne des Petroles' Fokra 10	9-46	1970	Dry in Cretaceous
Port Lyautey.	Societe Cherifienne des Petroles' Fokra 11	10-46	1540	Dry in Cretaceous
Port Lyautey.	Societe Cherifienne des Petroles' Oued Hamma 1	3-46	3610	Dry in Helvetian
Port Lyautey.	Societe Cherifienne des Petroles' Oued Hamma 2	12-45	1300	Dry in Tortonian
Port Lyautey.	Societe Cherifienne des Petroles' Oued Hamma 3	1-46	1540 3450	Dry in Tortonian
Port Lyautey.	Societe Cherifienne des Petroles' Oued Hamma 3-B	6-46	3450	Dry in Helvetian
Port Lyautey.	Societe Cherifienne des Petroles' Oued Hamma 5	2-46	1210	Dry in Tortonian
Port Lyautey.	Societe Cherifienne des Petroles' Oued Hamma 6	9-46	2610	Dry in Liasic
Port Lyautey.	Societe Cherifienne des Petroles' El Tleta 1	9-46	1150	Dry in Tortonian
Port Lyautey.	Societe Cherifienne des Petroles' Keebia 1	12-46	7300	Junked. Bottomed in Palaeozoic

Engineering and Geological Data on Morocco Oil Fields

TERRITORY AND FIELD	Est. Proved Area (Acres)	Gravity of Oil (API)	PRODUCING FORMATION: Local Name	Kind	Geologic Age	Depths of Wells (Feet): Minimum Top Pay	Maximum Depth Wells	Average Thickness of Pay (Feet)	Type Structure
Port Lyautey:									
Tselfat	130	44	Toarcian	Lime	Liasic	330		15	
			Domerien	Lime	Liasic	820		40	Anticlinal
			Domerien	Lime	Liasic	2625	5500	150	
Ain Hamra	300	45	Tortonian	Sand	Miocene	435	4674	9	Lenses
Bou Draa	340	45	Toarcian	Lime	Liasic	650	3000	15	Anticlinal

Drilling in Morocco

TERRITORY, FIELD AND AREA	Operating Company	WELLS COMPLETED IN 1945: Oil	Gas	Dry	Total Wells	Total Footage	WELLS COMPLETED IN 1946: Oil	Gas	Dry	Total Wells	Total Footage	Field Wells Drilling and Shut Down at End of 1946: Dr	SD	Total
Port Lyautey:														
Ain Hamra	Societe Cherifienne des Petroles	6		5	11	11,660	3			3	2,550			
Tselfat	Societe Cherifienne des Petroles	1			1	2,980								
Bou Draa	Societe Cherifienne des Petroles													
Wildcats Tests:														
Fokra Area	Societe Cherifienne des Petroles			3	3	4,130			4	4	7,340	1		1
Oued Hamma Area	Societe Cherifienne des Petroles			1	1	1,300			5	5	12,420	2		2
Keebia Area	Societe Cherifienne des Petroles								1	1	7,300			
Tselfat Nord Area	Societe Cherifienne des Petroles			1	1	3,380			4	4	8,770			
Bab Tiouka Area	Societe Cherifienne des Petroles			2	2	4,180			1	1	3,360			
Tleta Area	Societe Cherifienne des Petroles								1	1	1,150			
Totals		7		12	19	27,630	3		16	19	42,890	3		3

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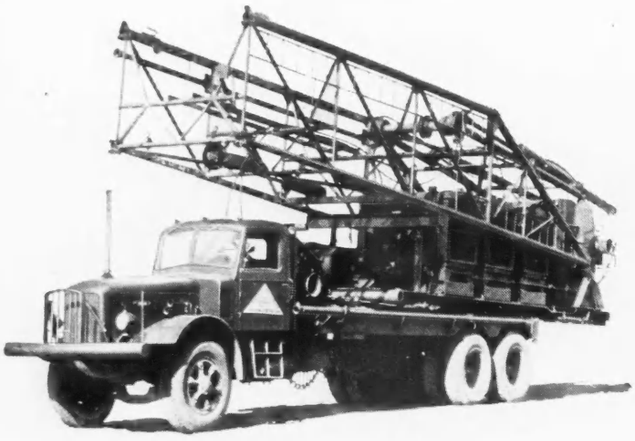

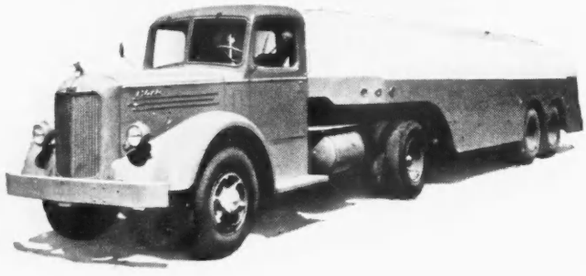

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Richardson & Bass
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EGYPT— Fields and Concessions

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EGYPT

DISCOVERY of the Sudr field by Anglo-Egyptian Oilfields, Ltd. (Dutch-Shell Group) in May, 1946, was the first success of the extensive exploration program launched in Egypt following the war.

The wildcat, located in the Sinai region about 31 miles southeast of Suez, was a joint venture with Socony-Vacuum Oil Company. The test was drilled to 3157 feet and on a pumping test at 2680-2925 feet the well indicated a production of 200 barrels daily.

During 1946 there were 10 wildcat tests drilled in Egypt and all were abandoned except the Sudr 1 discovery well. Six other wells were completed in the Ras Gharib field and the total footage drilled in the country, including wildcat tests, was 67,441 feet. This compares with 15 tests drilled in 1945, including three dry wildcats, and a total footage of 46,353 feet.

Until the Sudr discovery, there were two producing fields in Egypt—Ras Gharib and Hurghada—with Anglo-Egyptian being the only organization which has found oil in important commercial quantities.

During 1946, the two fields produced 8,913,000 barrels as compared with 9,405,000 barrels in 1945. The Ras Gharib field accounted for almost 95 percent of this production. The field is currently producing about 23,000 barrels daily from 81 wells, including 25 flowing wells. Hurghada's current production is about 900 barrels daily from 56 wells.

There have been two other producing areas in Egypt, but both are now virtually exhausted. In 1908, Anglo-Egyptian found production at Gemsa which has resulted in a cumulative output of 1,420,000 barrels. Operation at Gemsa is now suspended. The Egyptian government found oil at Abu Durba in Sinai in 1918 which resulted in the cumulative production of about 50,000 barrels. In 1931, 15 wells were producing from shallow depths in the Abu Durba area, but since then production has ceased entirely.

Three companies are listed as holding petroleum prospecting licenses and petroleum exploration permits in Egypt, namely Anglo-Egyptian, Socony-Vacuum, and Standard Oil Company of Egypt, the latter a subsidiary of Standard Oil Company (New Jersey).

Each of the three active companies holds some 240 exploration permits which in total are geographically distributed roughly as follows: Cairo-Suez area, 40 permits; Eastern Desert (East of the Nile), 60 permits; Sinai Peninsula and North Sinai, 230 permits; Western Desert, 390 permits.

There are two petroleum refineries in Egypt, both situated at Suez. One of these is a topping plant with a capacity of 1400 barrels daily operated by the Egyptian government. The other is operated by Anglo-Egyptian and has a crude charging capacity of 28,000 barrels daily and a cracking capacity of 7000 barrels daily.

Recent Drilling Operations in Egypt

	Wells Completed in 1945					Wells Completed in 1946				
				Total					Total	
FIELD	Oil	Gas	Dry	Wells	Footage	Oil	Gas	Dry	Wells	Footage
Ras Gharib	12		—	12	28,620	6			6	15,355
Hurghada										
Gemsa										
Wildcats			3	3	17,733	1		9	10	52,086
Totals	12		3	15	46,353	7		9	16	67,441

Wildcats Completed in Egypt During 1946

Territory	Company, Well, Location	Date Completed	Total Depth (Feet)	Results
Sinai	Anglo-Egyptian Oilfields, Ltd. and Socony-Vacuum's Ayun Musa 2, 9 miles southeast of Suez.	1-20	5808	Abandoned
Central Sinai	Standard Oil Co. of Egypt's Abu Hamth 1.	2-15	7132	Abandoned
Eastern Desert	Anglo-Egyptian Oilfields, Ltd. Myos Hormos 1, 12 miles northwest of Hurghada field.	5-15	5024	Abandoned
Gulf of Suez	Socony-Vacuum Oil Co.'s Dishet el Dhaba 5	5-24	3216	Abandoned
Sinai	Anglo-Egyptian and Socony-Vacuum's Sudr 1, 31 miles southeast of Suez.	5-24	3157	Sudr field oil discovery. Pumping test at 2680-2925 feet showed well capable of producing 280 barrels daily
Sinai	Anglo-Egyptain and Socony-Vacuum's Asl 1, 40 miles southeast of Suez.	7-24	4328	Suspended
Gulf of Suez	Standard of Egypt's Wadi Baba 1	9-25	4548	Abandoned
Western Desert	Standard of Egypt's Abu Roasch 1.	9-30	6289	Abandoned
Eastern Desert	Anglo-Egyptian's Myos Hormos 2, 15 miles northwest of Hurghada.	10-15	5800	Abandoned
Gulf of Suez	Socony-Vacuum's Ras Bakr 1	11-5	6784	Abandoned

Producing Oil Wells and Crude Oil Production of Egypt

FIELD	Operating Companies	Year of Discovery	OIL WELLS AT END OF 1946				CRUDE OIL PRODUCTION Barrels			
			Shut in	Producing: Flowing	Producing: Art. Lift	Producing: Total Producing	Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
Sudr	Anglo-Egyptian Oilfields, Ltd., Dutch Shell Group) and Socony-Vacuum Oil Co.	1946	1							1,500
Ras Gharib	Anglo-Egyptian Oilfields, Ltd.	1938	32	25	56	81	23,000	8,940,000	8,540,000	60,300,000
Hurghada	Anglo-Egyptian Oilfields, Ltd.	1913	3		56	56	900	456,000	370,000	36,700,000
Gemsa	Anglo-Egyptian Oilfields, Ltd.	1908	1						2,300	1,420,000
Totals			37	25	112	137	23,900	9,405,000	8,913,000	98,421,500

Engineering and Geological Data on Egypt's Oil Fields

FIELD	Proved Area (Acres)	Probable Ultimate Proved Acreage	Range of Gravity of Oil API	PRODUCING FORMATION: Name	Kind	Age	Depth of Wells (Ft.): Minimum Top Pay	Depth of Wells (Ft.): Maximum Total Depth	Average Thickness Pay (Feet)	Type Structure
Ras Gharib	1000	1300	25 to 26	Nubian	Sand	Carboniferous	1600	2400	400	Faulted
					Sand	Cretaceous	1600	2000	75	Monocline
					Lime	Miocene	1200	1900	300	
Hurghada	500	500	22 to 24		Conglomerate and Sand	Miocene and Cretaceous	700	2000	100	Anticline
Gemsa	40	40	39		Lime	Miocene	400	2000	100	Anticline
Sudr					Lime	Miocene	2680	2925	45	

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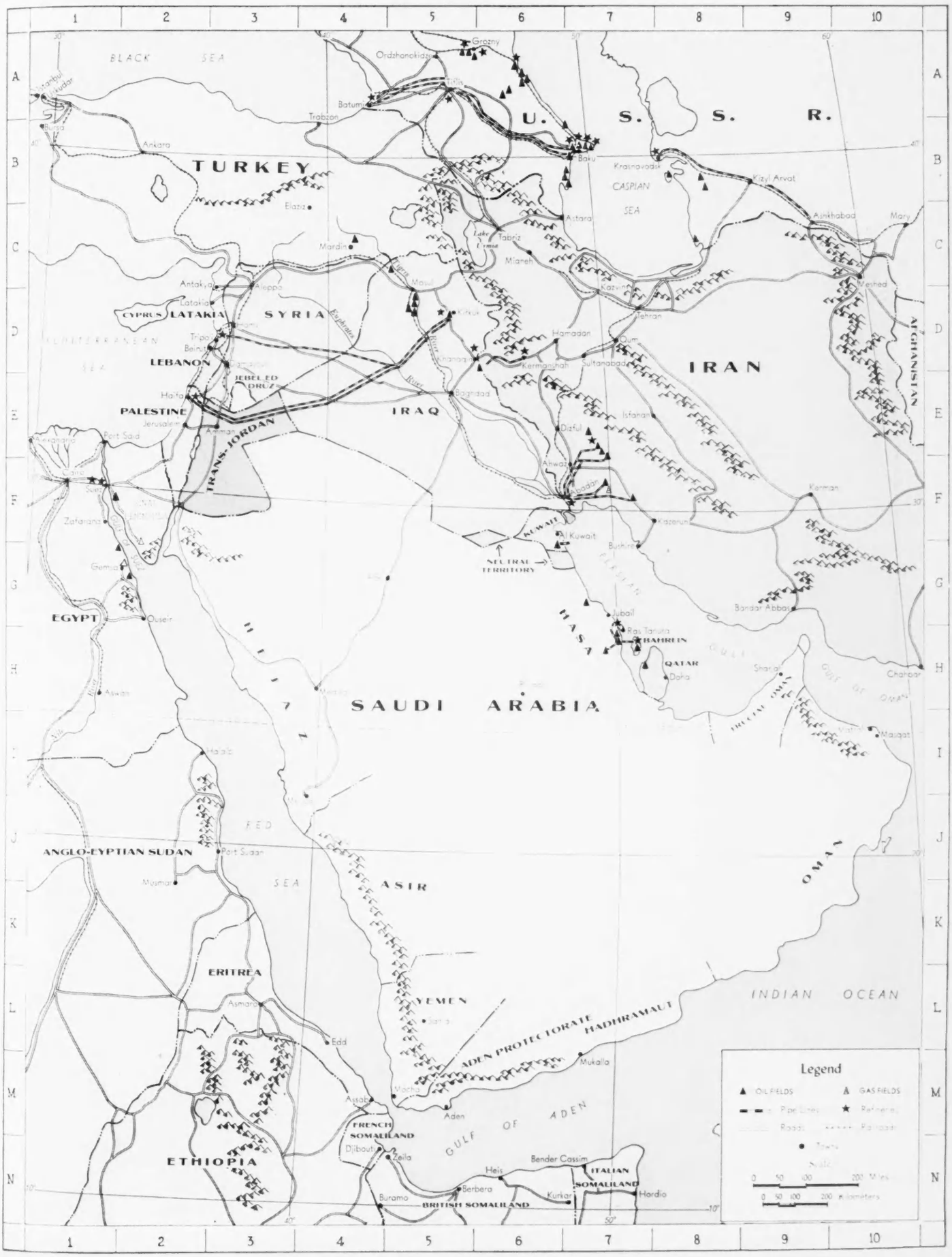
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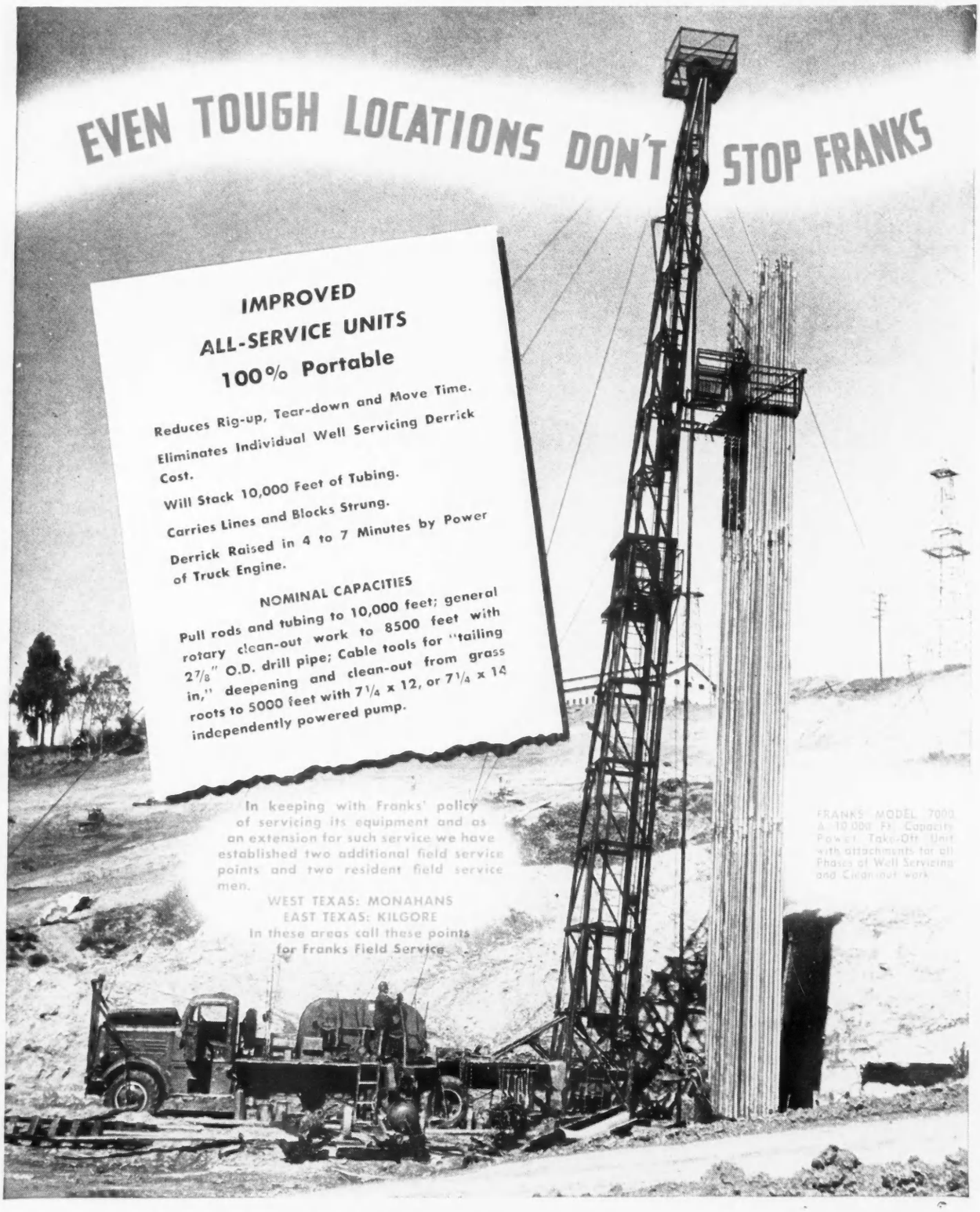
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A CONCERTED effort is being made to tap the vast oil resources of the Middle East and to make this crude oil available for world markets. Stymied by World War II, shortages of equipment and lack of adequate outlets, plans are taking shape which, if carried through, will increase available production in the Middle East to an estimated 1,620,000 barrels daily, nearly 2½ times the amount produced in 1946 and five times the area's output in 1938. The prospective increase in Middle East crude production by the various countries that constitute the region is shown in the accompanying table.

Plans call for the laying of new "big-inch" lines from the oil producing areas of Iran, Kuwait and Saudi Arabia to terminals on the Mediterranean Sea. Construction is in progress on a 16-inch carrier from Iraq to Haifa, Palestine. Completion of all the projected pipe lines would boost Middle East oil flow by 780,000 barrels daily, the estimated capacity of the projected carriers. Also, new refineries are considered for the coastal areas of the Mediterranean Sea, and proposed additions to the Abadan refinery in Iran would increase the capacity of that plant by 80,000 barrels daily. Therefore, the completion of the pipe lines and refinery additions would boost the potential producing capacity of Middle East oil fields by 860,000 barrels daily.

To meet this anticipated boost in production, operators of Middle East oil fields are presently engaged in a major drilling program, expansion of gathering systems and construction of new terminals on the Persian Gulf. Plans call for the completion of the new outlets and refinery additions by 1950 or soon thereafter. Middle East production at the end of 1946 was about 782,000 barrels daily and therefore the production must be increased by slightly more than 800,000 barrels daily within the next three or four years if the daily capacities of the lines are to be maintained.

Most of the anticipated production of Middle East crude will find its markets in Europe and Africa. The demand for petroleum in Europe today is the greatest in history. European expansion plans call for the rehabilitation of refineries destroyed or damaged during the war and the construction of entirely new plants. Some of the Middle East oil also will be marketed in the United States and South America.

Proved reserves of the Middle East are conservatively estimated at 17½ billion barrels with additional indicated reserves of 11 billion barrels.

Middle East Crude Production and Reserves

COUNTRY	DAILY OIL PRODUCTION Average 1946	End of 1946	1950 if Projects Completed	RESERVES (Billions of Barrels) Actually Proved	Additional Indicated
Iran	401,000	425,000	750,000	5½	1
Iraq	90,000	90,000	270,000	4½	1
Kuwait	19,000	33,000	100,000	4½	5
Saudi Arabian-Bahrein	188,000	234,000	500,000	2½	3½
Qatar	.....	.....	.....	½	½
Totals	698,000	782,000	1,620,000	17½	11

Iran

IRAN, currently the largest oil producing area in the Middle East, produced 144,896,466 barrels during 1946 as compared with 127,407,581 barrels the previous year. At the end of 1946, Iran's daily output was about 406,000 barrels.

Iran's fields are located on Anglo-Iranian Oil Company's concession of approximately 64 million acres along the Iraq border of the Persian Gulf. Up for confirmation is Soviet-Iranian Oil Company concession across the northern part of the country near the Caspian Sea.

During 1946 six wells were completed in Iranian fields with footage drilled totaling 8523 feet. Three wells were com-

Producing Wells and Oil Production of Iran

FIELD	Year of Discovery	OIL WELLS AT END OF 1945 Producing: Shut In	Flowing	Total Producing	CRUDE OIL PRODUCTION Bbls. Daily at End of 1946	Year 1945	Year 1946
Agha Jari	1937		9	9	92,000	17,698,372	30,687,696
Gach Saran	1926	4	3	3	40,000	14,415,855	14,178,684
Haft Kel	1925	1	23	23	194,000	71,698,927	66,058,746
Masjid-i-Sulaiman	1908	11	29	29	60,000	20,210,814	27,797,484
Pazanun	1937	3				240,000	204,282
White Oil Springs	1934		1	1	17,000	2,523,094	5,265,936
Naft-i-Shah	1923		2	2	3,000	620,435	703,638
Totals		19	67	67	406,000	127,407,581	144,896,466

Anglo-Iranian Pipe Lines in Iran

ORIGIN	Terminus	Length Miles	Diameter (Ins.)	No. of Pump Stations	Capacity of Line (Bbls. Daily)	Year Completed	Status
Masjid-i-Sulaiman	Abadan	133	10	3		from	In use
Masjid-i-Sulaiman	Abadan	133	10	3	80,000	1916 to	In use
Masjid-i-Sulaiman	Abadan	133*	12	3		1927	In use
Haft Kel	Abadan	136*	12	2			In use
Haft Kel	Abadan	136	12	2		From	In use
Haft Kel	Marid	124	12	2	205,000	1929 to	In use
Haft Kel	Kut Abdullah	61	12			1938	In use
White Oil Springs	Wais	32	10-12				
Agha Jari	Abadan	97	12		130,000	1945	In use
Agha Jari	Mashur	42	12			1946	In use
Gach Saran	Abadan	166	12		40,000	1940	In use
Mashur	Abadan	60	12			1941	In use
Naft-i-Shah	Kermanshah	146	3	4	2,600	1935	In use

* Includes 9 mi'es 16" line common to both these lines.

Engineering and Geological Data on Iran's Oil Fields

FIELD	Est. Proved Area Acres	Gravity of Oil API	Local Name	Kind	PRODUCING FORMATION Geologic Age	Depths of Wells Ft. Minimum Top Pay	Maximum Total Depth	Avg. Thickness of Pay Ft.	Type Structure
Masjid-i-Sulaiman	34,560	37.8	Asmari	Lime	Oligo-Miocene	2900	3000	1000	Anticline
Haft Kel	28,800	36.4	Asmari	Lime	Oligo-Miocene	3000	4000	1000	Anticline
White Oil Springs	6,400	33.8	Asmari	Lime	Oligo-Miocene	5600	5700	1000	Anticline
Agha Jari	19,200	32.7	Asmari	Lime	Oligo-Miocene	6000	9000	600+	Anticline
Pazanun	6,400	66.7	Asmari	Lime	Oligo-Miocene	6000	8000	700+	Anticline
Gach Saran	38,400	30.2	Asmari	Lime	Oligo-Miocene	4000	7000	1500	Anticline
Naft-i-Shah	3,840	42.8	Kalhur	Lime	Oligo-Miocene	2600	2700	250	Anticline

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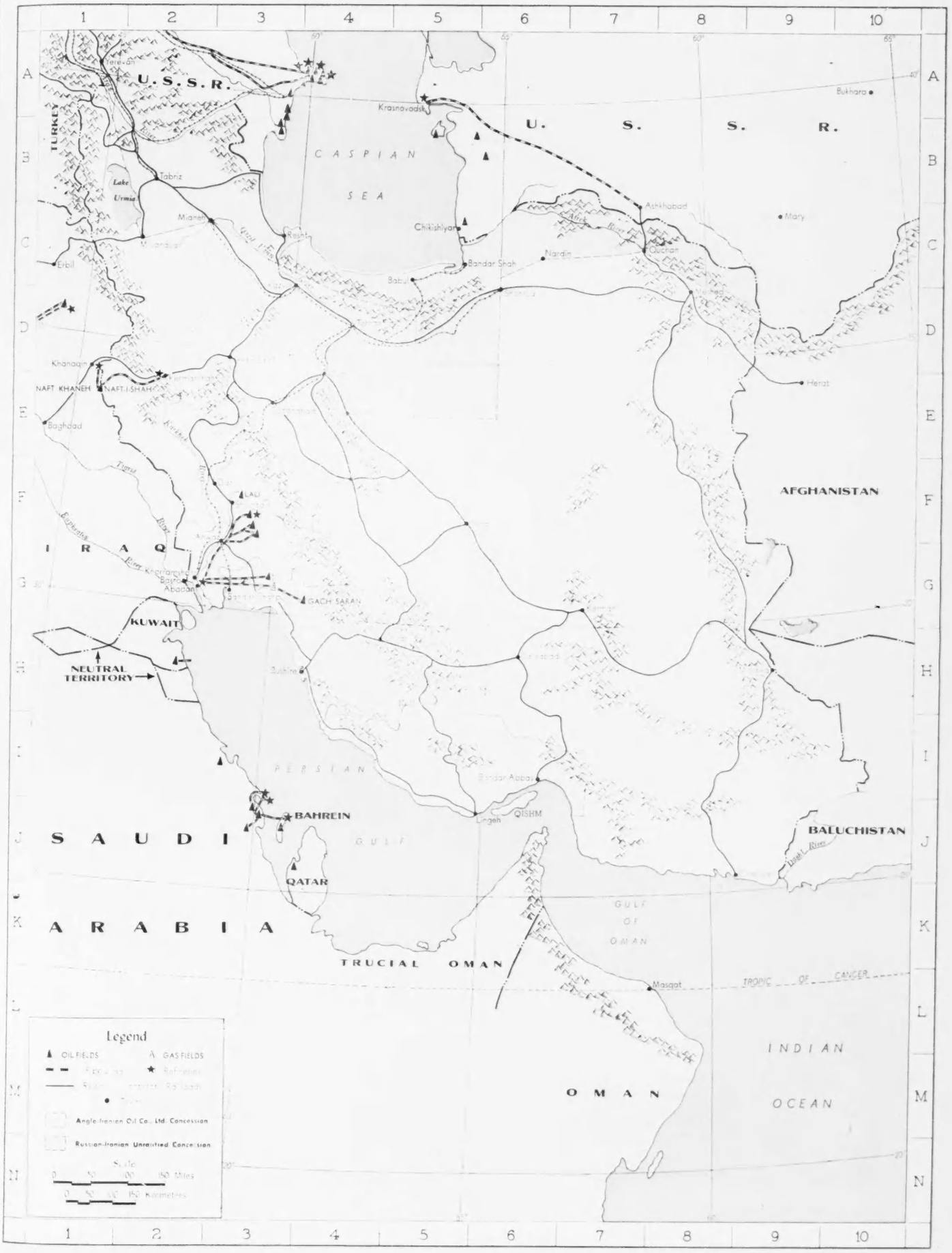
MIDDLE EAST— Iran Concessions



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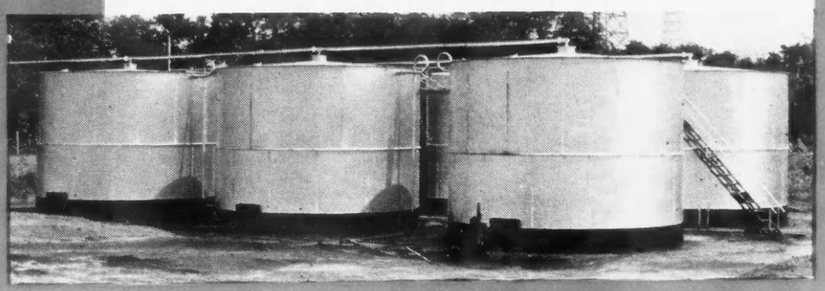

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pleted at Agha Jari, two at Haft Kel and one at Lali. At the end of the year there were 67 wells flowing in Iran, a majority being at Haft Kel and Masjid-i-Sulaiman.

A long-range production program is indicated for Iran with Standard Oil Company (New Jersey) and Socony-Vacuum Oil Company having concluded an agreement whereby the two firms would purchase large quantities of crude (reported to be upwards of 100,000 barrels daily) from Anglo-Iranian. The agreement covers a period of 20 years. The three companies have formed Middle East Pipe Lines, Ltd., to construct a 300,000-barrel-daily pipe line from Iran to a Mediterranean port.

One of the largest refineries in the world is operated by Anglo-Iranian at Abadan in Iran. This plant has a crude charging capacity of 400,000 barrels daily with a cracking capacity of 125,000 barrels. In 1946, the crude runs totaled about 125 million barrels. Additions are planned, including a new catalytic cracker and lubricating units.

Kermanshah Petroleum Company, an Anglo-Iranian subsidiary, also operates a small plant at Kermanshah. Crude comes from the Naft-i-Shah field about 40 miles south of Qasr-i-shirin on the Iran-Iraq border. The plant has a daily capacity of 2100 barrels with crude runs in 1946 amounting to 600,000 barrels.

Iraq

VIRTUALLY all concessions in Iraq are held by Iraq Petroleum Company and its subsidiaries. The parent company owns a 30,000-square-mile concession which runs 75 years from 1925; Basrah Petroleum Company, a subsidiary, together with Mosul Petroleum Company hold a 90,000-square-mile grant running 75 years from 1938 while Khanaquin Oil Company has a small concession near Khanaquin. Syria Petroleum Company, Ltd., an associate of Iraq Petroleum, has a concession covering the major part of Syria, about 76,000 square miles.

Lebanon Petroleum Company holds a small prospecting permit in the vicinity of Tripoli.

Petroleum Development (Palestine), Ltd., holds a number of permits in Palestine stretching down the coast and looping around Gaza and Kurnub.

Petroleum Development (Trans-Jordan), Ltd., an IPC associate, is negotiating for several permits in Trans-Jordan.

Exploratory Activity

With new capitalization funds, estimated at about $70 million, Iraq Petroleum Company (through subsidiaries) is launching what is probably the most extensive search for oil ever conducted in the Middle East. Wildcat operations are under way or about to begin in four countries. Near Tripoli, in the Lebanon, Lebanon Petroleum Company has started operations on its Tourbol location. Petroleum Development (Palestine), Ltd., has two locations in Southern Palestine, one at Gaza on the coast and the other at Kurnub, 40 miles northeast of Gaza, toward the Dead Sea. In Syria, Syria Petroleum Company, Ltd., is progressing on two locations. One is at Dola, northeast of Homs in the western desert, and the other is at Bafloun.

Extensive development also is under way at Kirkuk. During 1946, IPC completed four oil wells in this field and at the end of the year four rigs were active. During 1946, crude output in Iraq totaled 32,777,430 barrels as compared with 32,349,240 barrels in 1945.

Refineries

The largest oil refinery in the Mediterranean area is located at Haifa, Palestine. This is the 90,000-barrel plant of Consolidated Refineries, Ltd., which is owned jointly by Anglo-

Producing Oil Wells and Crude Oil Production in Iraq, by Fields

FIELD	Operating Companies	Year of Discovery	OIL WELLS AT END OF 1946				CRUDE OIL PRODUCTION Barrels			
			Shut in	Producing: Flowing	Producing: Art. Lift	Producing: Total Producing	Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
Ain Zalah	Mosul Pet. Co.	1940	12				Shut in			
Kirkuk*	Iraq Pet. Co.	1927	14	10		10	90,000	32,349,240	32,777,430	315,927,075
Qaiyarah Area:	Mosul Pet. Co.									
Jawan		1933	5				Production limited to a few thousand barrels yearly for local consumption. Cumulative production estimated at approximately 200,000 barrels.			
Najmah		1933	20							
Qaiyarah		1927	39	1		1				
Qasab		1935	5							
Qaiyarah Total	Mosul Pet. Co.		69	1		1				
Total Iraq			95	11		11	90,000	32,349,240	32,777,430	315,927,075

* There have been a total of 68 wells drilled on the Kirkuk structure. Of the 14 shut-in wells seven are observation wells to observe gas-oil and oil-water levels.

Engineering and Geological Data on Iraq Oil Fields

FIELD	Probable Ultimate Proved Area Acres	Range of Gravity of Oil API	PRODUCING FORMATION: Name	Kind	Age	Depth of Wells Ft.: Minimum Top Pay	Maximum Total Depth	Average Thickness of Pay Feet	Type Structure
Kirkuk	83,500	36	Qarah Chauq	Limestone	Eocene-Miocene	950	3200	800	Closed Anticline
Qaiyarah Area	35,000	19	Qarah Chauq	Limestone	Miocene	700	1000	300	Closed Anticline
Qaiyarah Area	12,000	19	Pilsener	Limestone	Upper Cretaceous	1500	1800	300	Closed Anticline
Ain Zalah	3,600	32	Ain Zalah	Limestone	Cretaceous or Mio.	5000	6000	200	Closed Anticline
Naft-Khaneh			Asmari	Limestone	Miocene-Eocene	3000		200-300	Anticline

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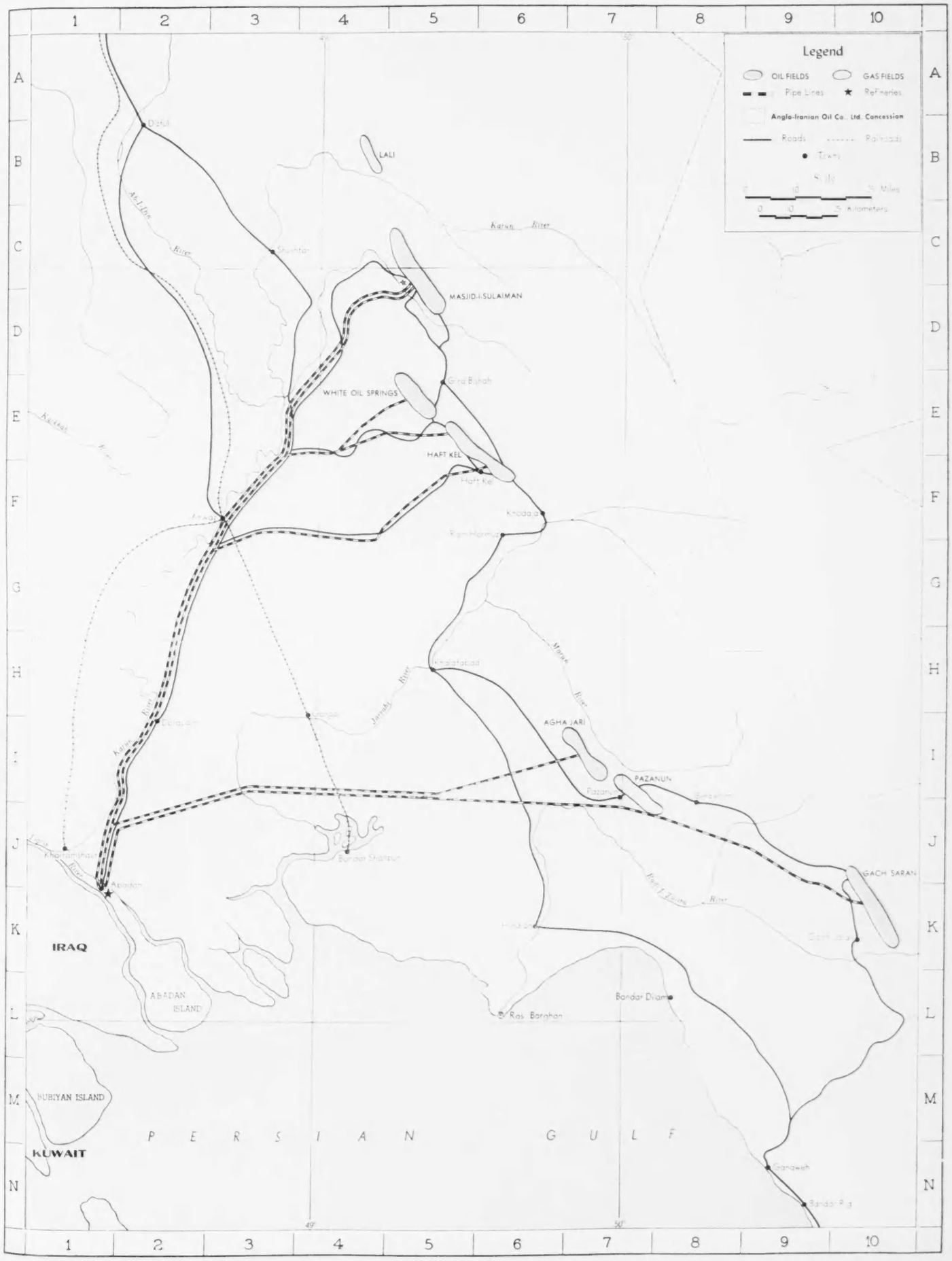
MIDDLE EAST— Iran Fields



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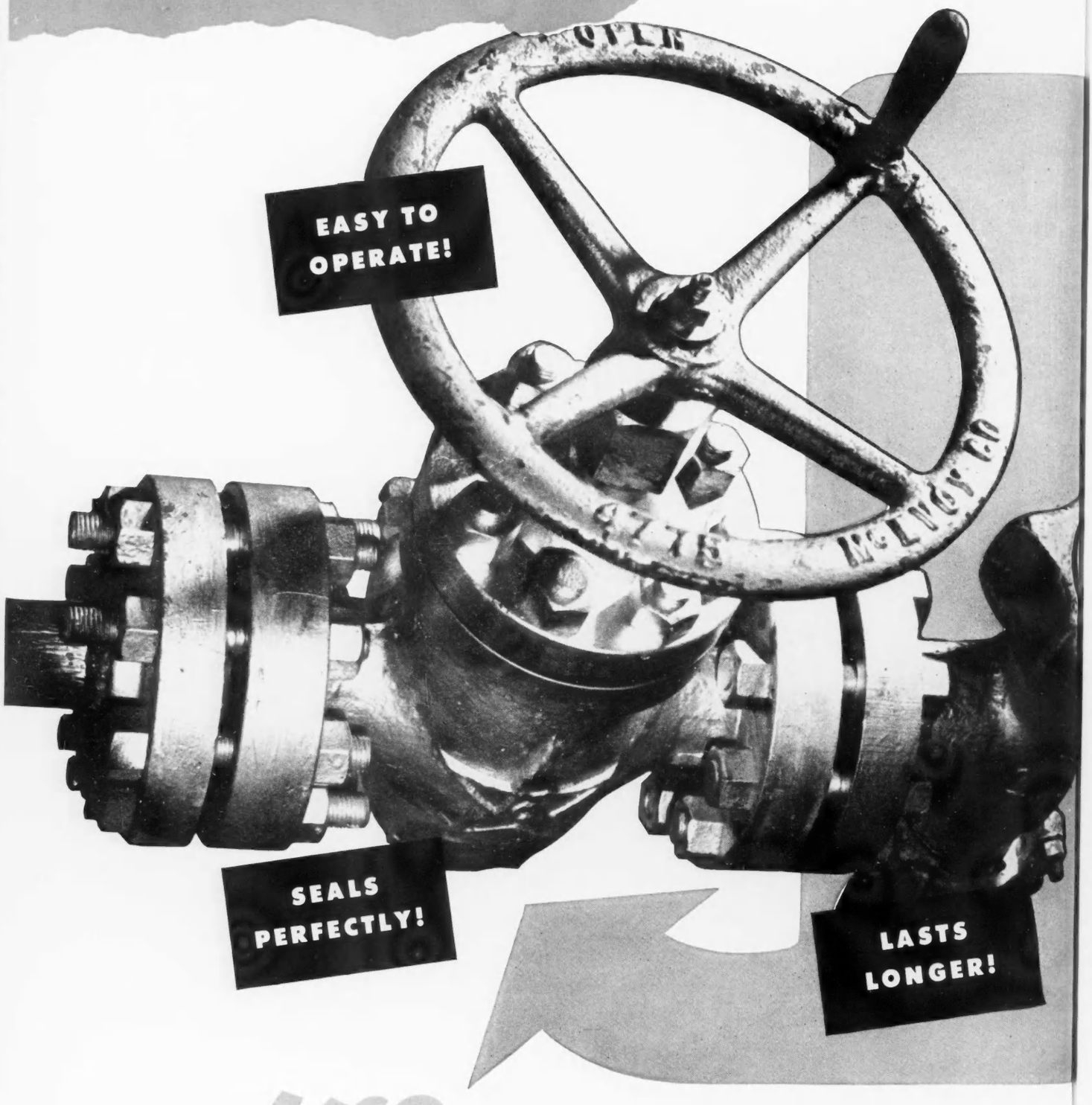

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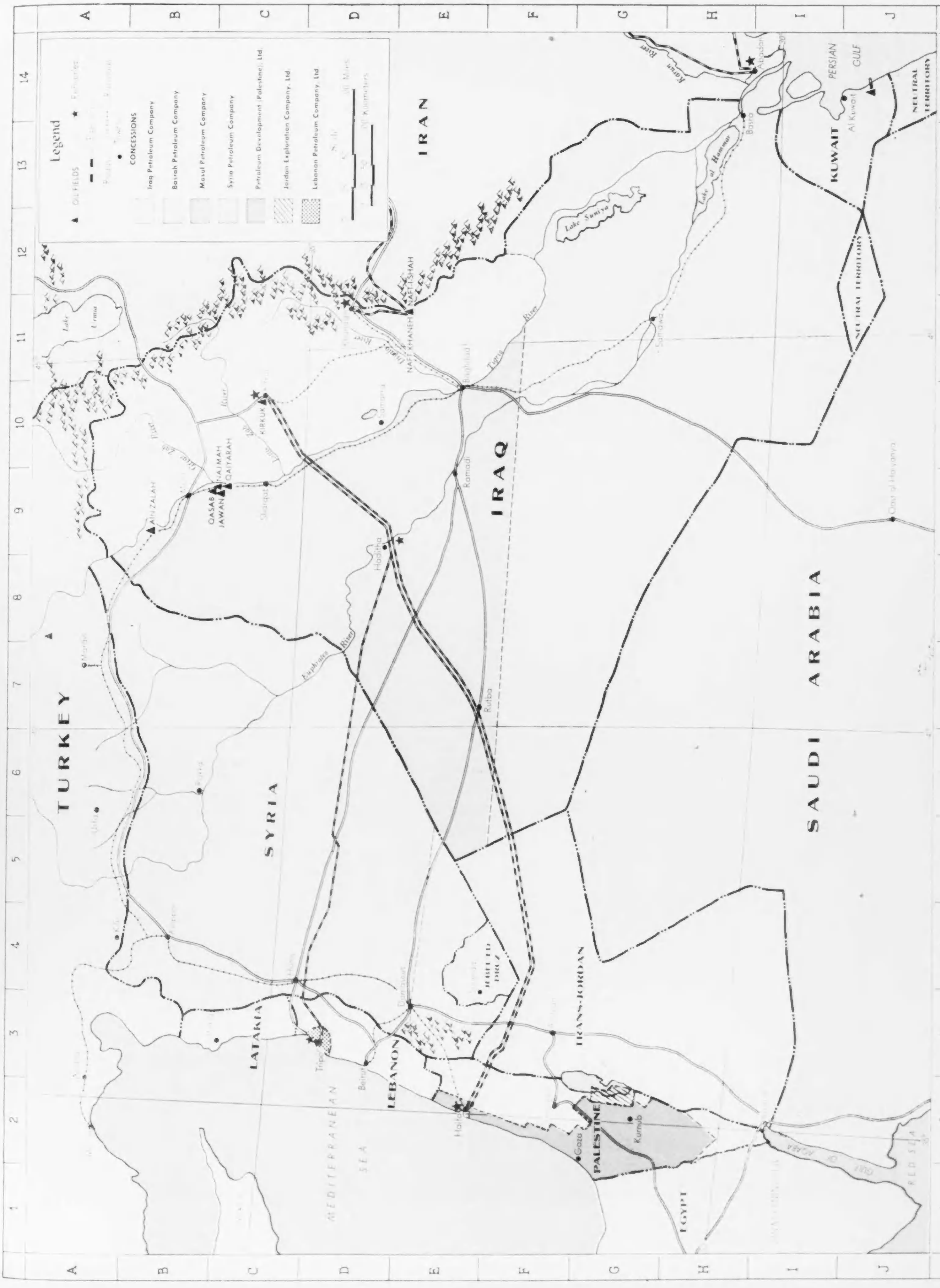
MIDDLE EAST—Iraq, Lebanon, Palestine and Syria Concessions



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IS DEPENDENT UPON CONSTANT DEVELOPMENT OF NEW TECHNIQUES AND BETTER PERFORMANCE OF PRESENT EQUIPMENT

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10 Types For Varying Drilling Conditions

Type OB-1
Long Tooth Bit

SECURITY Model "4" Rock Bits make straighter, full gauge hole in a shorter length of time under all drilling conditions. The high center pattern gives a straight hole—the properly applied hardfacing and correct bearing design give full gauge hole and the all forged construction plus exceptionally strong bearings makes a rugged bit suitable for use with excessive weights and speeds.

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Unexcelled for opening up coreholes or rat holes drilled ahead of the initial bore. The Model "46" Hole Opener does not require welding equipment to change cutter assemblies. The new "demountable" design allows the cutters to be changed on the rig by use of simple hand tools. The Security Hole Opener is the most rugged and efficient tool of its kind on the market.

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The one reamer that will ream to the full desired dimension by shearing all excess formation from the walls of the hole. An unexcelled stabilizer. The cutters have circumferential contact with 30% to 35% of the hole as well as vertical contact over the entire length. Three types of cutters are available for all reaming and stabilizing requirements.

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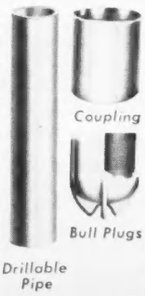

The use of this material for subsurface operations greatly increases the efficiency of production and completion work. SECURALOY saves operators millions of dollars by safeguarding oilfield investments from the dangers of frozen equipment . . . choked production and premature abandonment. SECURALOY may be removed with chemicals or a bit.

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Their use eliminates the hazards and expensive fishing jobs caused by stuck packers. SECURALOY packers and hangers are engineered for simplicity in design and dependability in operation. Being made of SECURALOY they can be easily removed from the well by chemicals or drilling bits if they become stuck or frozen. This important feature allows "hold-down" slips to be used to prevent movement in either direction once the packer is set. This double anchor is particularly valuable when bottom hole pressures are high.

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Branches in All Principal Oil Fields

Iranian Oil Company and Anglo-Saxon Petroleum Company (Shell), with Anglo-Iranian in charge of plant management. The refinery processes the major portion of the crude produced by Iraq Petroleum Company with the balance of the crude remaining at the Tripoli terminal shipped to Haifa by tankers. Plans to expand this plant are developing. Khanaquin Oil Company has a 6500-barrel daily capacity plant at Alwand, Iraq. French interests in IPC operate a small plant at Tripoli. In addition to these plants, small crude oil topping plants are located in the Kirkuk field and at K-3 pump station for the operating needs of IPC.

Construction of two large refineries at Tripoli is proposed. One of these plants would be built by Compagnie Francaise des Petroles and the other by Standard Oil Company (New Jersey) and Socony-Vacuum Oil Company.

Iraq Petroleum Company's program also includes expansion of the pipe line system. The present system consists of a double 12¾-inch line from Kirkuk to K-3 pump station near Haditha, the branching point, with single lines to Tripoli and Haifa. The Kirkuk-Haifa line is 621 miles long and the Kirkuk-Tripoli carrier is 532 miles long. This system was completed in 1934 and has a daily capacity of 90,000 barrels.

Construction is now under way on a 620-mile, 16-inch line from Kirkuk to Haifa, paralleling the existing line. Completion of this line will double the present capacity of 90,000 barrels daily. Plans have also been advanced to duplicate the Kirkuk-Tripoli line with a larger carrier.

Iraq's Annual Production Record
(In Barrels)

YEAR	Daily Average	Annual Output
Prior to 1936		29,127,805
1936	81,000	29,600,000
1937	86,000	31,396,300
1938	75,000	27,227,300
1939	93,000	33,761,300
1940	48,000	17,350,600
1941	29,000	10,657,500
1942	48,000	17,434,000
1943	67,000	24,445,600
1944	81,645	29,800,000
1945	88,628	32,349,240
1946	89,801	32,777,430
Total		315,927,075

Oil Statistical Sources

The national government owns the *mineral rights* in Iraq and the government department which grants oil concessions is the Ministry of Economics with headquarters at Baghdad. *Geological maps and data* can be obtained from the Geological Section of the Ministry of Economics.

The only active oil company in Iraq is Iraq Petroleum Company, which, with its subsidiaries, holds virtually all the oil concessions in the country. Therefore, information relating to *well records, geological tops, production and dry holes maps, electrical logs* and other drilling and production data are not available except from this company.

Kuwait

KUWAIT, a small country at the northern end of the Persian Gulf, is considered the site of the largest single reserve of petroleum in the world—the Burghan field. Proved reserves of this field have been set at about 4½ billion barrels by Dr. E. DeGolyer, geologist and head of the Technical Oil Mission to the Middle East which visited Kuwait in 1944. Dr. DeGolyer estimates that 4½ to 5½ billion barrels additional are indicated but not developed to give the field a possible reserve of about 10 billion barrels.

The Kuwait concession, consisting of 6000 square miles, is held by Kuwait Oil Company, Ltd., equally owned by Gulf Exploration Company (Gulf Oil Corporation) and Anglo-Iranian Oil Company. The concession was granted on December 23, 1934, and runs for 75 years.

The Burghan field has never had an opportunity to produce anything like its potential. Operations halted at the beginning of World War II when the field was in danger of being seized by the Germans, all wells but one being plugged. Since the war, most of the efforts of the operators have been toward redrilling and reconditioning the plugged wells, and construction of additional tankage and loading facilities. There is no actual trunk pipe line from the field to the Persian Gulf terminal, as the field is near the shoreline. Field tankage is served by a gathering system and the oil is loaded directly through short loading lines into tankers. The first shipment of crude from Kuwait was in June, 1946, and commencing July 1 the field was able to approach a daily average output of about 33,000 barrels for the remainder of the year.

Kuwait Crude Oil Production
(In Barrels)

1946	Monthly Total	Daily Average
June	240,000	8,000
July	492,500	15,887
August	853,404	27,529
September	1,048,102	33,810
October	1,216,821	39,252
November	1,117,658	37,255
December	1,021,297	32,445
Total	5,989,762	27,980

Production is from eight flowing wells with their output restricted solely because of transportation limitations. Kuwait wells, undoubtedly, could produce at three or four times their present rates without damage. The 1946 total output of 5,989,726 barrels represents the total cumulative production, since the first oil was shipped during the year.

No new wells were drilled during 1946. The first part of the year was devoted to reconditioning of plugged holes. Two rigs are in operation, one being used for deepening Burghan 1, the discovery well. When completed in the early part of February, 1938, Burghan 1 had been drilled to a depth of 3692 feet, at which point it had penetrated only 10 feet into the Cretaceous pay where completion was made. Subsequent wells were drilled deeper and dually completed, and before the present nine wells had been completed, at least seven separate producing horizons had been found and an area of approximately 20,000 acres had been proved without drilling a dry hole. Oil-water contact was found in one of the sands at 4500 feet.

A second rig is drilling the Burghan 10. Seven additional rigs probably will be placed in operation by the end of 1947 or shortly thereafter.

No new exploratory drilling has been announced. One wild-

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MIDDLE EAST— Iraq Fields

MALONEY CRAWFORD

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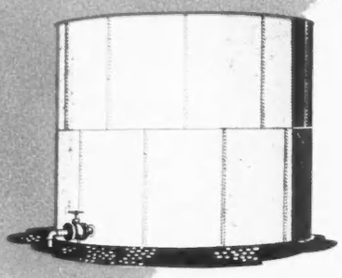

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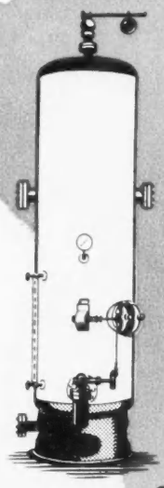
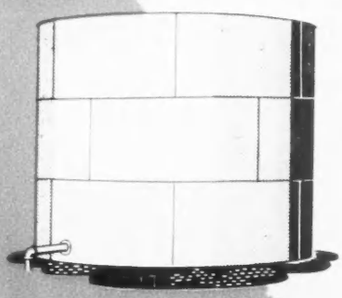
Maloney-Crawford Oil and Gas Separators embody improvements in design, construction and separation; fully meeting API and ASME Code requirements. New interior design and mist extractor element assure highest percentage of dry gas when operating within the rated capacities of the various type separators.



OIL AND GAS SEPARATORS



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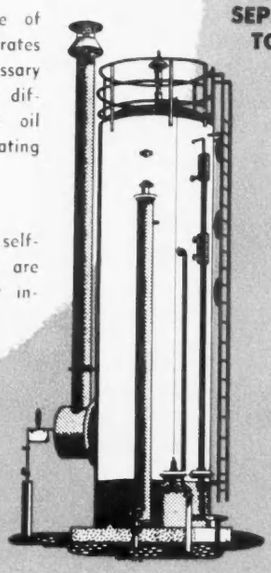

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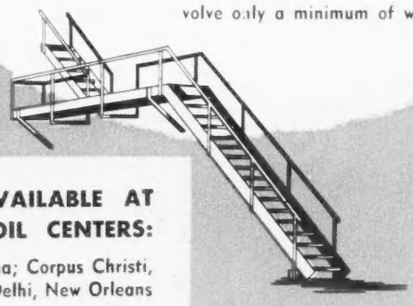
Maloney-Crawford cantilever-type, self-supporting Stairways and Walkways are rigid, dependable and durable, yet involve only a minimum of weight.



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cat had been started north of the field in July, 1942, but operations were suspended because of the war. Originally it had been designated as the Burghan 10, but the operators decided to change the numbering, designating this test as a wildcat, and continuing the numbering system with a new No. 10 well in the field.

The Burghan field's first major pipe line outlet is seen in a deal completed between Anglo-Iranian Oil Company, Standard Oil Company (New Jersey) and Socony-Vacuum Oil Company. These companies would set up the Middle East Pipelines, Ltd., for construction of a pipe line from Iran to a Mediterranean port with a feeder line from the Burghan field to connect into the new carrier somewhere near the origin which will probably be near Abadan at the head of the Persian Gulf. However, it will be 1950 before this carrier can be in operation.

Saudi Arabia-Bahrein-Qatar

SAUDI ARABIA'S crude oil production during 1946 soared sharply, exceeding the total production of the country up to the end of 1945, and plans are now taking shape which point to an even greater annual output. During 1946 the production amounted to 60,340,662 barrels as compared with a cumulative output of 52,408,580 barrels to and including 1945. The flow in 1946 compared with 21,310,996 barrels produced in 1945.

The program of expansion by Arabian American Oil Company, owned jointly by Standard Oil Company of California and The Texas Company, holder of some 450,000-square miles of concessions in Saudi Arabia, calls for accelerated development of its producing facilities, installation of additional refinery equipment, construction of a new deep water port at Dammam on the Persian Gulf and construction of a railroad to serve its operations in the producing fields.

Originally this expansion program was to be financed through the acquisition of 40 percent of Arabian American's capital stock by Standard Oil Company (New Jersey) and Socony-Vacuum Oil Company. Standard of New Jersey would acquire 30 percent and Socony-Vacuum 10 percent. However, the acquisition of this stock has been delayed pending outcome of discussions and legal action in London concerning the "Red-Line Agreement" reached in 1928 among participants in Iraq Petroleum Company.

Pending final conclusion of the stock deal, Arabian American has borrowed $102 million on a 10-year bank loan with $76,500,000 being guaranteed by Standard of Jersey and $25,500,000 by Socony-Vacuum. Upon completion of the stock deal, the purchase payments will be used to retire the loan.

Trans-Arabian Pipe Line Company, also owned equally by Standard of California and The Texas Company, are preparing to lay a 1050-mile, 30-inch pipe line from the Saudi Arabia fields to a terminal port on the Mediterranean Sea. At such time as the stock interest in Arabian American is taken by Standard of Jersey and Socony-Vacuum, the two companies plan also to acquire stock interest in Trans-Arabian so that the new interests in Trans-Arabian will be in the same proportions as the new interests in Arabian American. Until stock purchases are actually made, a loan of $125,million has been arranged in order to provide funds for construction of the proposed line. This loan, for a 15-year period, has been guaranteed by Standard of California, The Texas Company, Standard of Jersey and Socony-Vacuum. Contracts have been awarded for the laying of the 30-inch line but selection of a terminal port on the Mediterranean is yet to be made. The terminal will be in either Palestine, Lebanon or Syria.

Saudi Arabia Fields

Saudi Arabia presently has four oil fields, namely, Abqaiq, Dammam, Qatif and Abu Hadriya. The latter is a one-well field and has no pipe line outlet. The total proved reserves of these four fields have been estimated as low as 3715 million

Drilling in Saudi Arabia

FIELD	Wells Completed in 1945			Wells Completed in 1946		
	Oil	Total Wells	Total Footage	Oil	Total Wells	Total Footage
Dammam	1	1	4,900	6	6	28,905
Qatif	1	1	7,510	0	0	
Abqaiq	1	1	6,175	5	5	33,730
Totals	3	3	18,585	11	11	62,635

Annual Crude Oil Production
(In Barrels)

YEAR	Bahrein	Saudi Arabia
Prior to 1939	22,287,055	580,000
1939	7,588,554	3,934,000
1940	7,073,919	5,074,838
1941	6,794,157	4,310,110
1942	6,240,627	4,430,492
1943	6,571,609	4,808,144
1944	6,713,795	7,800,000
1945	7,308,938	21,310,996
1946	8,009,802	60,340,662
Total to January 1, 1947	78,588,456	112,749,242

Producing Wells and Oil Production of Saudi Arabia and Bahrein Island

COUNTRY and FIELD	OPERATING COMPANY	Year of Discovery	OIL WELLS AT END OF 1946				CRUDE OIL PRODUCTION (Barrels)			
			Shut in	PRODUCING Flowing	Art. Lift	Total Producing	Daily at End of 1946	Year 1945	Year 1946	Cumulative Through 1946
Saudi Arabia:										
Abqaiq	Arabian American Oil Company	1940	1	7		7	112,000	17,455	24,783,738	24,801,193
Dammam	Arabian American Oil Company	1936	5	33		33	100,000	21,124,381	34,585,118	86,807,083
Qatif	Arabian American Oil Company	1945		1		1	2,675	169,160	971,806	1,140,966
Abu Hadriya	Arabian American Oil Company	1940	1				No Pipe Line Connection			
Total Saudi Arabia			7	31[1]		31	214,675	21,310,996	60,340,662	112,749,242
Bahrein Island:										
Bahrein	Bahrein Petroleum Company	1932		66		66	20,000	7,308,938	8,009,802	78,588,456

[1] Includes one gas well.

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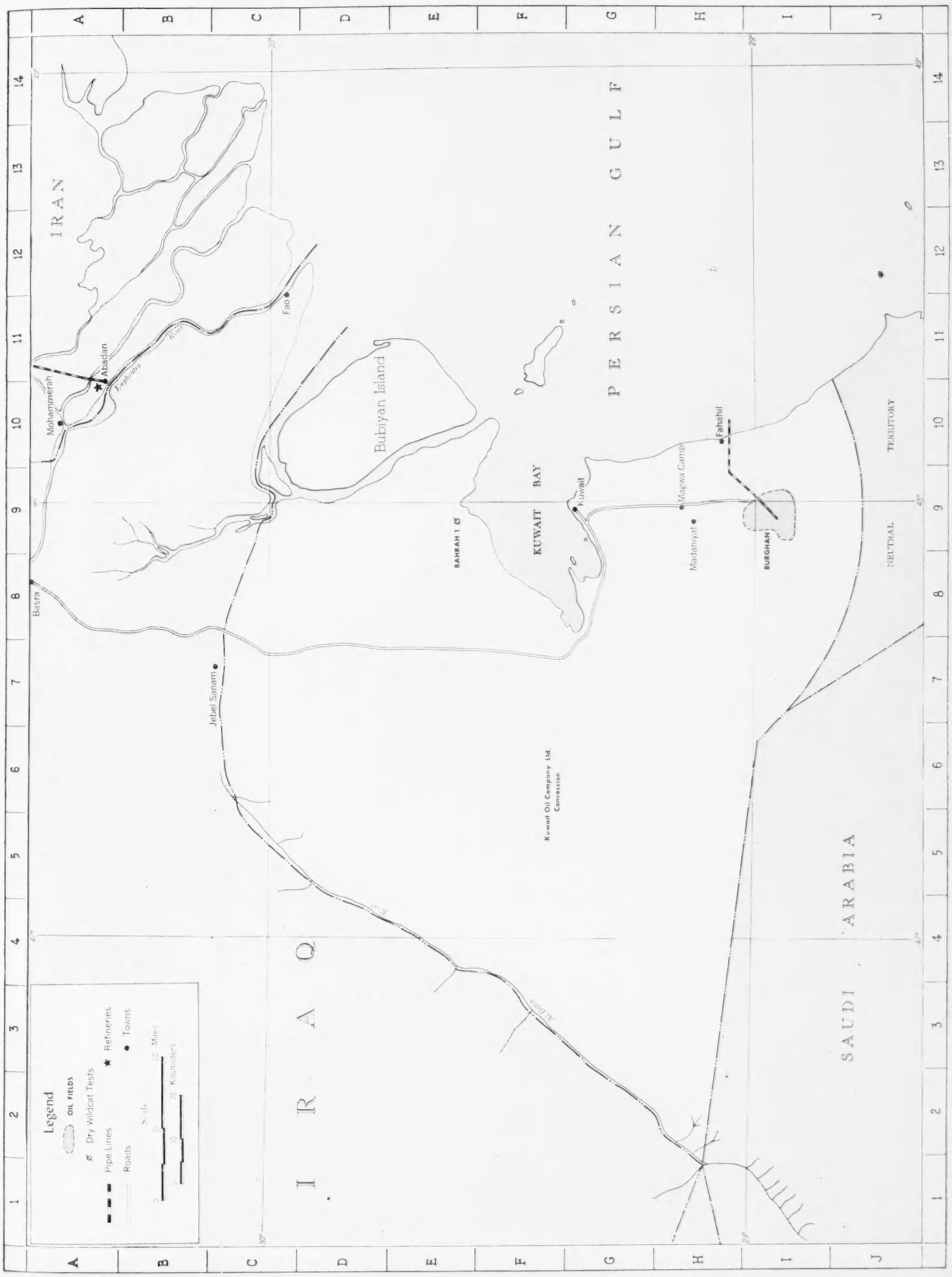
MIDDLE EAST— Kuwait Field and Concession



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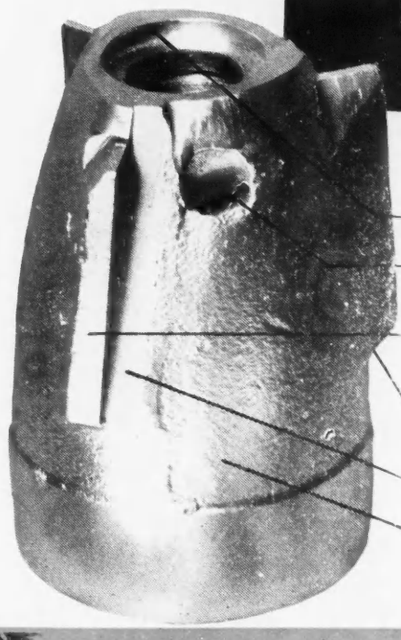

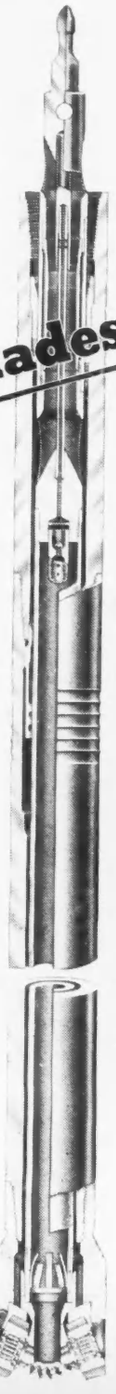

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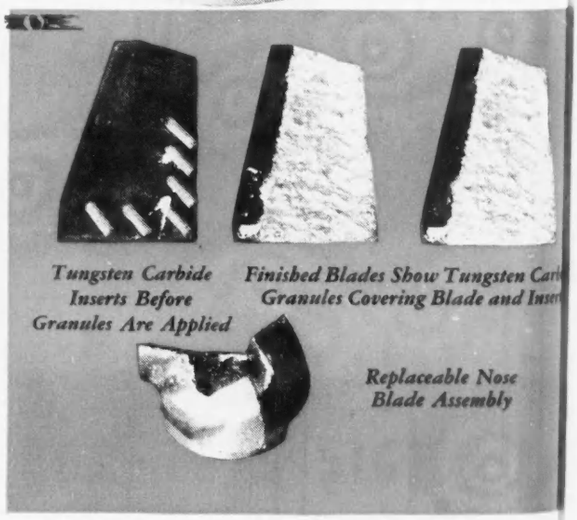
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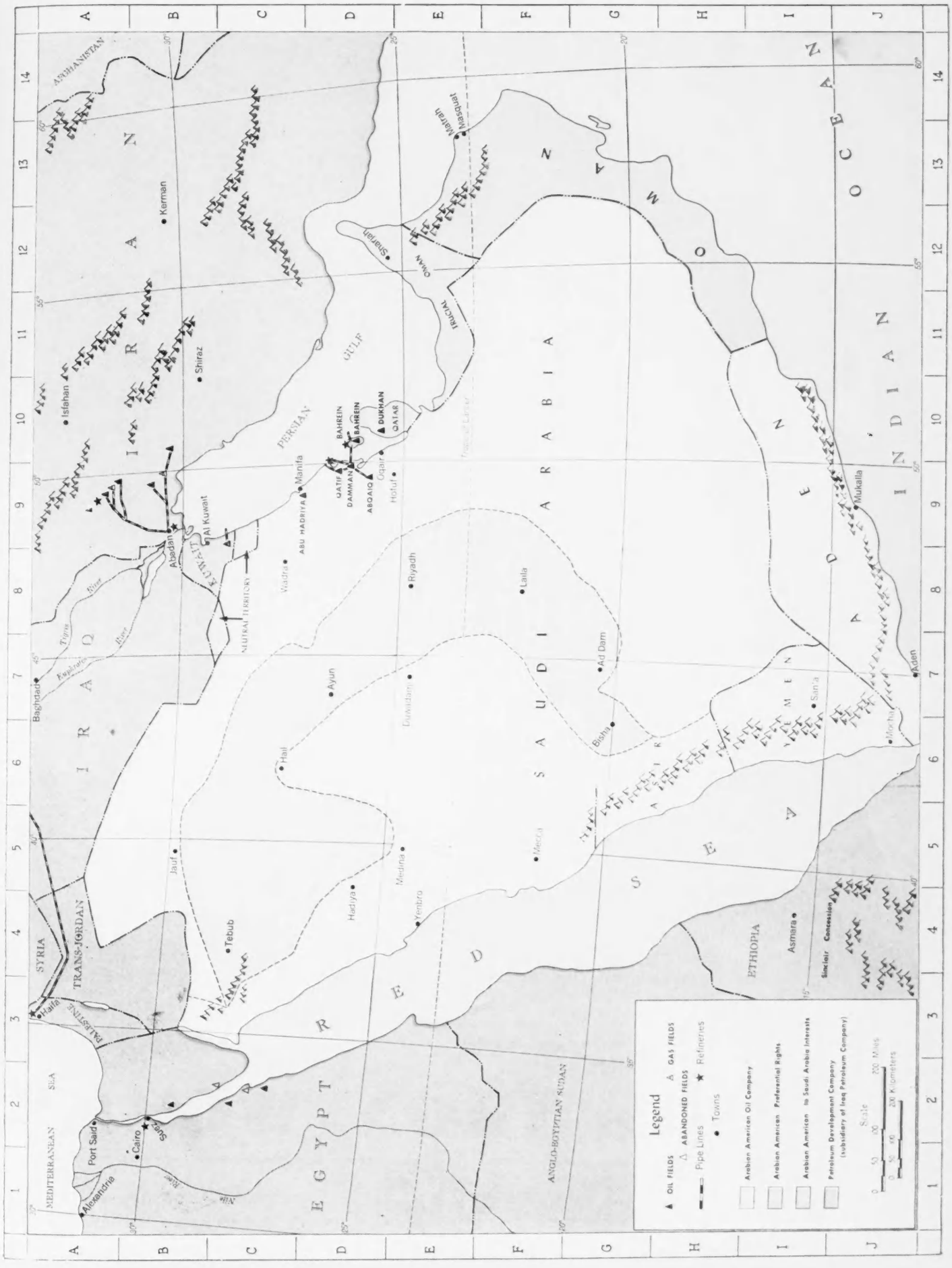
MIDDLE EAST—Saudi Arabia Peninsula and Bahrein Island Concessions



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MIDDLE EAST—Saudi Arabia-Bahrein-Qatar —Continued

barrels and as high as 5790 million barrels. It has also been estimated an additional 2 to 2½ billion barrels of reserves is indicated but not yet proved.

Oil was first discovered at Saudi Arabia by Arabian American in 1936 at the *Dammam field*. The field presently has 33 flowing wells, including one gas well, with a total daily production of about 100,000 barrels. During 1946 the field produced 34,585,118 barrels and had a cumulative production of 86,807,083 barrels at the end of 1946. During 1946 six oil producers were completed in the field with a total footage drilled of 28,905 feet. Reserves of the Dammam field are estimated between 600 and 615 million barrels.

The Dammam field is a faulted anticline and covers a proved area of some 9000 acres. The field has two limestone producing horizons in the Cretaceous formation. The Bahrein lime is topped at about 1600 and the lower Arab lime comes in at about 4400 feet. The gravity of the Dammam crudes ranges from 34- to 68-degrees (API).

The *Abqaiq field*, largest in Saudi Arabia, was discovered in 1940 and presently has seven producing wells which were flowing a total of 112,000 barrels daily at the end of 1946. During 1946 five new wells were completed with total footage drilled being 33,730 feet.

Estimated reserves of the Abqaiq field range from 3 to 5 billion barrels. In 1946 the field produced 24,783,738 barrels with the cumulative output being 24,801,193 barrels.

The most important completion in Saudi Arabia last year was the No. 10 well in the Abqaiq field. The well was completed at 7420 feet and established an oil column for the field approximately 1500 feet high. It completely penetrated the producing zone and found no water. As yet, edgewater has not been found in the field. The Abqaiq 10 is credited with having added at least a billion and a half barrels to the reserves of the field. Production is from the Arab lime in the Cretaceous topped around 5600 feet. The gravity of the oil ranges from 19 to 38 degrees (API).

The *Qatif field* was discovered in 1945 and as yet has only one producer. At the end of 1946 this well was flowing 2675 barrels daily. During 1946 the output was 971,806 barrels as compared with 169,160 barrels in 1945 making a cumulative production of 1,140,966 barrels at the end of last year. Reserves of the Qatif field are estimated at 50 million barrels. Production in the Qatif field is from the Arab lime in the Cretaceous formation topped at about 7100 feet. The gravity is 29-38 degrees (API).

The *Abu Hadriya field*, another one-well area, was discovered in 1940 and the lone well has been shut in because of no pipe line connection. A second test was started in 1946 but was shut down. Reserves of this one-well field are estimated at 140 million barrels. The field is the deepest producing area in Saudi Arabia with the production coming from the Arab lime in the Cretaceous formation topped at 10,000 feet.

During 1946 the reconditioning of wells cemented during the war was completed at Dammam. At the end of the year one rig was running at Dammam and four in the Abqaiq field. Rigging up operations were under way at five locations at Abqaiq and one was rigging up at North Abqaiq.

Bahrein Activity

Bahrein Petroleum Company's production on Bahrein Island during 1946 was steady at about 20,000 barrels daily. The company, owned jointly by Standard of California and The Texas Company, produced 8,009,802 barrels in 1946 as compared with 7,308,938 barrels in 1945. Cumulative output at the end of 1946 was 78,588,456 barrels. During the year six wells were completed and producers now total 66. The field produces from the Arab lime at 2000-2250 feet and 4000-4600 feet. The oil is 33.5-gravity (API).

Crude Oil Refineries

Arabian American's refinery at Ras Tanura ran during 1946 at over-rated capacity. Toward the end of the year it finally passed a rate of 100,000 barrels per day and will continue to do this in 1947. The refinery is fed by pipe lines from the Dammam, Qatif and Abqaiq fields.

Bahrein Petroleum Company's refinery on Bahrein Island was running at about 105,000 barrels daily capacity at the end of 1946. Besides crude from the Bahrein field, the refinery also processes oil from Saudi Arabia which is delivered to the plant through a pipe line across the Gulf of Selwa.

The company also expects to complete its modern asphalt plant as an addition to the refinery by the end of 1947.

Qatar Development

The Qatar Peninsula concession, owned by Petroleum Development, Ltd., (Iraq Petroleum Company) first came into oil production in 1940 with the completion of the Dukhan 1 at 5786 feet. The second well was completed at 6016 feet and later a dry hole was drilled. The field has been shutin because of the lack of outlets but the company plans to revive activity this year. Production is from the Kerkrit lime

Crude Oil Pipe Lines of Saudi Arabia

COMPANY	Origin (Field or Town)	Terminus	Length (Miles)	Diameter (Ins.)	Capacity of Line (Bbls. Daily)	Status
Arabian American Oil Co.	Dammam	Bahrein	34	12	100,000	In Use
Arabian American Oil Co.	Dammam	Ras Tanura	23	12	118,000	In Use
Arabian American Oil Co.	Dammam*	Ras Tanura	39	10	65,000	In Use
Arabian American Oil Co.	Abqaiq	Dammam	40	12¾ 14	100,000	In Use
Arabian American Oil Co.	Abqaiq	Dhahran	40	14	110,000	In Use

* Via. Qatif Field.

Engineering and Geological Data on Saudi Arabia, Bahrein, Qatar Fields

COUNTRY, FIELD	Est. Proved Area (Acres)	Gravity of Oil (API)	PRODUCING FORMATION			Depth of Wells, (Feet)		Average Thickness of Pay (Feet)	Type Structure
			Local Name	Kind	Geologic Age	Minimum Top Pay	Maximum Depth		
Saudi Arabia:									
Dammam	9,000	34-68	Bahrein	Lime	Cretaceous	1600	2300		Faulted
			Arab	Lime	Cretaceous	4400	4900	4	Anticline
Abqaiq	11,000	19-38	Arab	Lime	Cretaceous	5600	7400	210	Anticline
Qatif		29-38	Arab	Lime	Cretaceous	7100	7500	187	Anticline
Abu Hadriya	6,500		Arab	Lime	Cretaceous	10000	10220	110	Anticline
Bahrein Island:									
Bahrein	10,000	33.5	Arab	Lime	Cretaceous	2000-4000	2250—4600		Elongated Dome
Qatar:									
Dukhan		36	Kerkrit	Lime	Jurassic or Cret	5785	6015	50	Anticline

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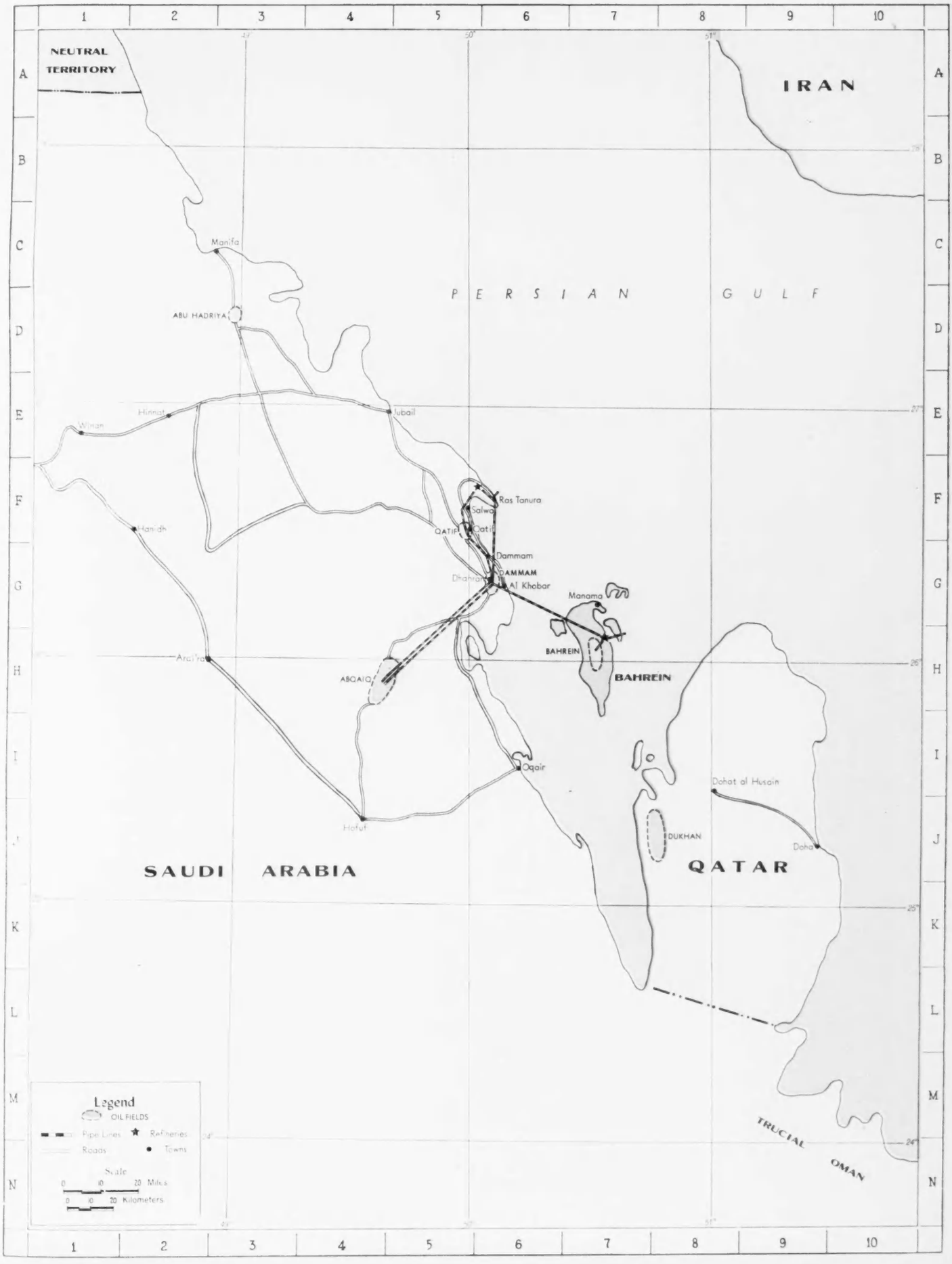
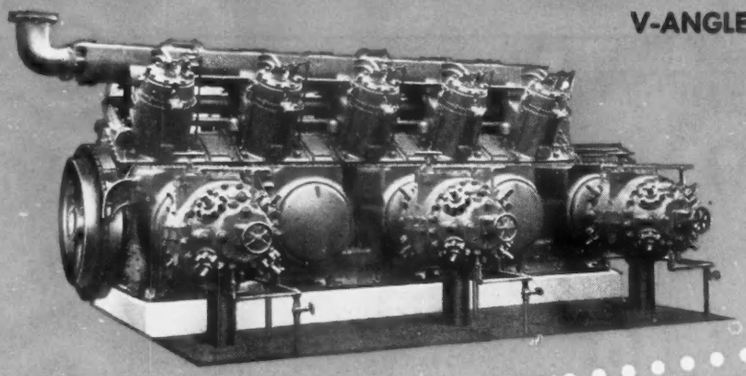
MIDDLE EAST— Saudi Arabia, Bahrein and Qatar Fields





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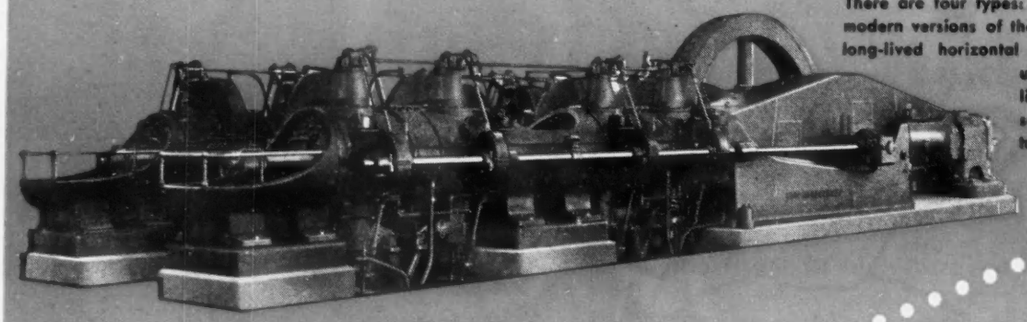

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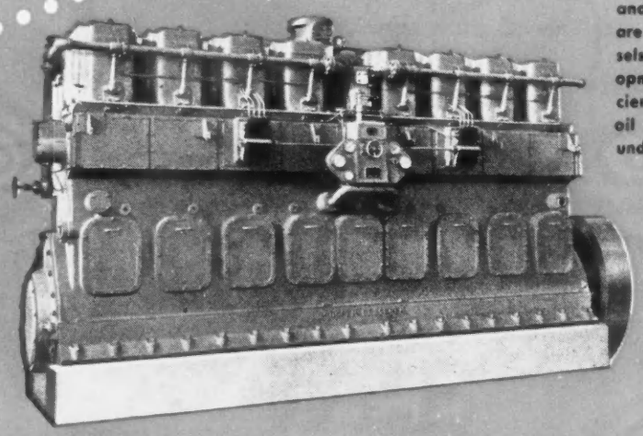

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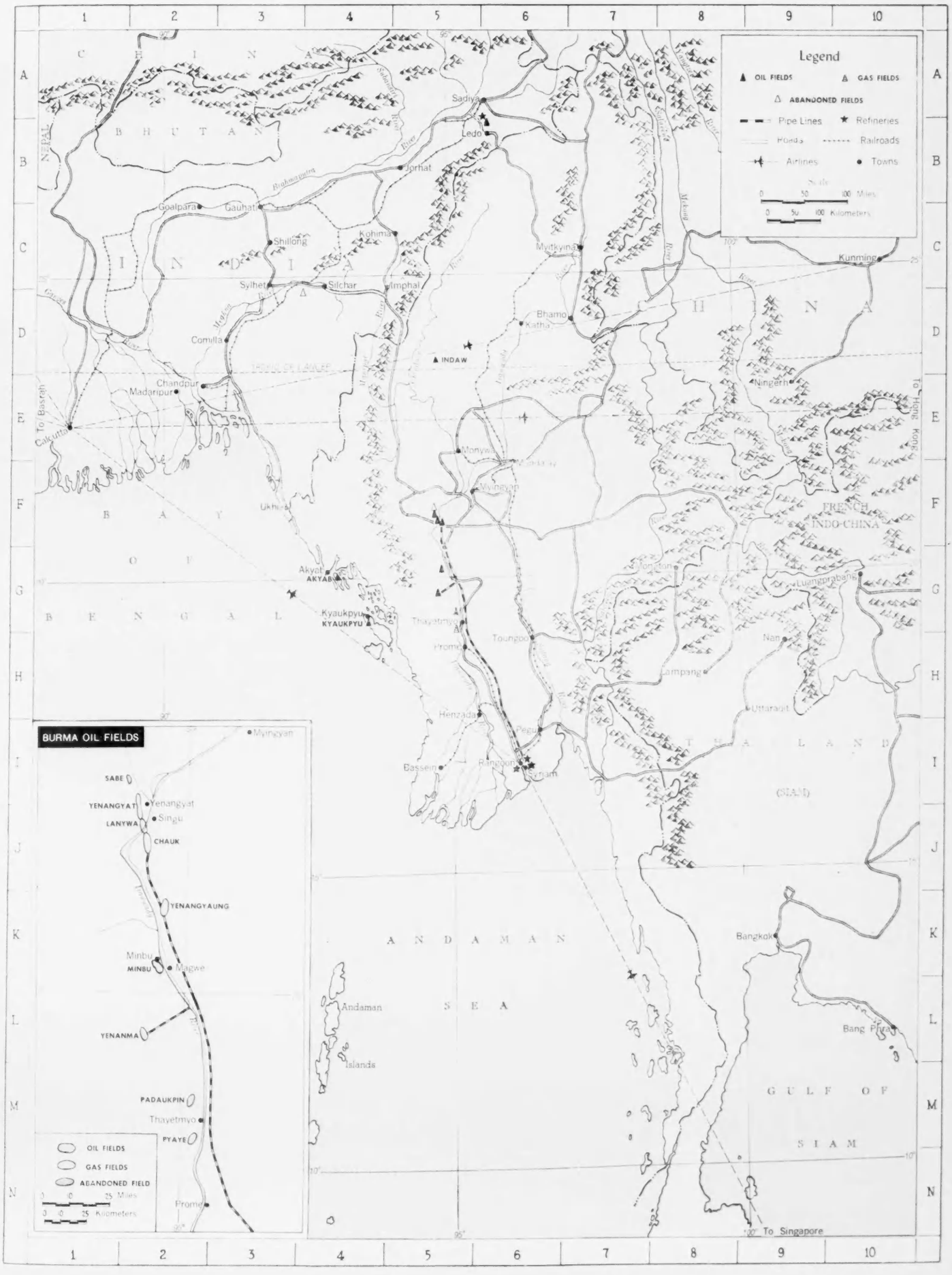
BURMA—Irrawaddy River Fields



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BURMA

OIL operations in Burma during 1946 were almost negligible. Burmah Oil Company, largest operator in Burma, has been gradually setting about the rehabilitation of the Yenangyaung field, but most of the wells are badly damaged and will need to be redrilled. Prospects for 1947 in Burma are also dim and substantial production will not be started for another year or two.

Of the approximately 5900 wells drilled in the Burma fields, 4355 were producing before the war. In 1942, when British interests destroyed the wells and refineries instead of leaving them intact for the Japanese, Burma's production was estimated at 7,762,000 barrels annually, or about 21,500 barrels daily. During Japanese occupation, restoration of the wells was effected to the extent of about 5650 barrels daily. Following recapture of the producing areas by the Allies, production is estimated at 750,000 barrels annually.

Besides a host of smaller companies, there are three major companies operating in Burma, the largest being Burmah Oil Company. The other two are British Burmah Petroleum Company and Indo-Burma Petroleum Company.

Pipe Line and Refineries

With the exception of a small quantity processed in a few local topping plants, Burma's oil, prior to the war, was refined at Burmah Oil Company's Syriam refinery, near Rangoon. The refinery has been out of action since its destruction by the British to prevent its use by the Japanese. The big bottleneck in Burma's present crude oil production is the inactivity of the Syriam refinery, and not until reconstruction of the plant is well under way will attempts be made to produce much oil from the fields again. Before its destruction the plant had a rated capacity of 20,000 barrels daily with a cracking capacity of 3000 barrels daily.

Under normal operation, a pipe line connected the plant with Burmah Oil Company's producing fields. This system consisted of a 4-inch line from the Yenangyat field to Singu, an 8-inch carrier from the Singu field to Yenangyaung, and a 10-inch trunk line from that field to the refinery at Rangoon, a distance of approximately 300 miles. This pipe line also was a war casualty.

In addition to the Burmah refinery at Syriam, other plants were operated by Indo-Burma Petroleum Company at Thilawa and by British Burmah Petroleum Company at Seikgyi. These plants, destroyed to keep the Japs from using them, have not been rebuilt.

Burma Oil Fields

The Yenangyaung field consists of a number of areas, locally called Khodaung, Twingone, Beme, and Minlindaung. The field extends approximately seven miles in length from north to south and about three-quarters of a mile in width.

In this field the Mio-Pliocene Irrawaddy system overlies unconformably the Oligocene-Miocene Pegu system. The productive portions of the Pegu are at least 2000 feet thick and probably more.

Oil has been extracted at Yenangyaung for several centuries. Until the Japanese occupation, descendants of the original oil workers were still operating the 300 to 400-foot hand-dug wells. A short distance away, company-owned wells were being operated by the most up-to-date methods. At least 4375 wells were located in the Yenangyaung area which is notable for a remarkably long continuity of yield.

The Chauk fields, one of the most important in Burma, comprises the Chauk (formerly known as Singu), Lanywa, Yenangyat and Sabe areas, which are situated on one geologic structure, a long, assymmetric anticline similar to Yenangyaung, but with the assymmetry reversed, the steep dip here being to the eastward. The Irrawaddy River, which at Chauk is normally about two-thirds of a mile wide, crosses the structure north of its center, separating the Chauk area on the southeast from Lanywa and Yenangyat on the northwest. Chauk is much the most important of the group.

At Chauk and Lanywa there are large river training walls and a considerable area has been reclaimed from the Irrawaddy, and wells drilled thereon. At Lanywa a number of highly-inclined wells have been drilled to reach the producing sands under the river.

With the exception of a small part near the south of the field, the Chauk field is essentially operated by Burmah Oil Company. About 955 wells had been drilled at Chauk before the war, with production ranging from a few gallons to as high as 1600 barrels per well daily and depths from 1800 to 5000 feet. Six productive zones have been proved but between these are water-bearing sands.

The Lanywa field is held by Indo-Burma and is virtually a northwest extension of the Chauk field. There are about 125 wells in the field which produce from depths of 1700 to 3200 feet. Water troubles are negligible here.

The Yenengyat and Sabe fields are structurally continuous with that at Chauk. Wells in the Sabe field are not now producing. Yenangyat is characterized by extremely rough topography. About 450 wells have been drilled in these two areas, in addition to the native hand-dug wells, some of which still produce.

The Indaw field, in the Upper Chindwin district, is the most northerly of the Burmese fields and is held under lease by Indo-Burma. Because the field is about 20 miles east of the Chindwin River nearly 300 miles from its junction with the Irrawaddy River, it is almost inaccessible. The structure is a low dome. Indaw production, stored at the field during low-water season, is piped during high water to the river and transported by barge to Rangoon.

In the Thayetmyo district of Burma, small production has been found from shallow wells drilled at Yenanma and at Pyaye, eight miles south of the town of Thayetmyo. Indo-Burma has a dry gas field producing from about 2600 feet.

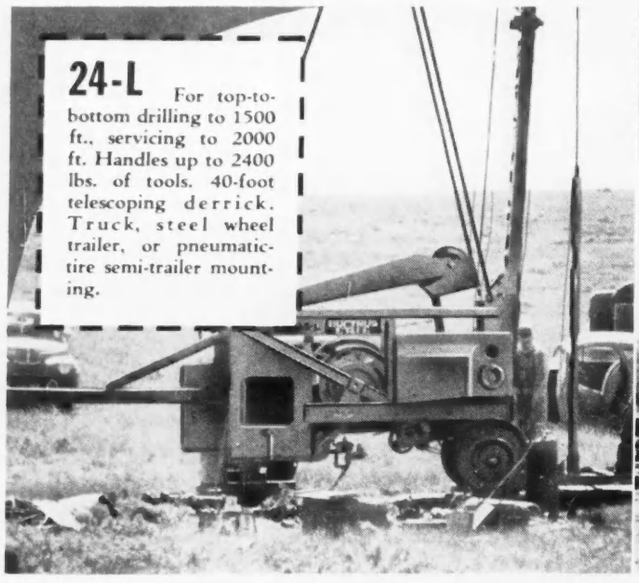
In the Minbu area are situated the fields of Minbu Town, Palanyon, and Yethaya, separate pools but generally grouped together. They are along a line of folding somewhat similar to the Chauk-Yanyaw-Yenangyat anticline, steeply assymmetric and locally overturned and faulted. The productive area is very narrow.

In other areas there has been found oil seepages with negligible production. Output at Akyab, on the Boronga Islands near Akyab, and at Kyaukpyu is not more than a barrel a day.

(The cooperation of the geological department of the Burmah Oil Company, Lyd., is gratefully acknowledged.)

Engineering and Geological Data on Principal Burma Oil Fields

			PRODUCING FORMATION					
					Depth of Wells (Ft.)			
FIELD	Est. Proved Area (Acres)	Gravity of Oil API	Kind	Geologic Age	Minimum Top Pay	Maximum Total Depth	Type Structure
Yenangyaung	850	37	Sand	Miocene-Oligocene	350	5000	Anticline
Chauk-Lanywa	2500	39.6	Sand	Oligocene	2000	5000	Asymmetric Anticline
Yenangyat		38.8	Sand	Oligocene	400	4200	Faulted Asymmetric Anticline
Indaw	160	31.1	Sand	Miocene		2000	Anticline
Yenanma	40		Sand	Oligocene	100	1700	Monocline
Minbu		37.8	Sand	Miocene-Oligocene			Faulted Asymmetric Anticline



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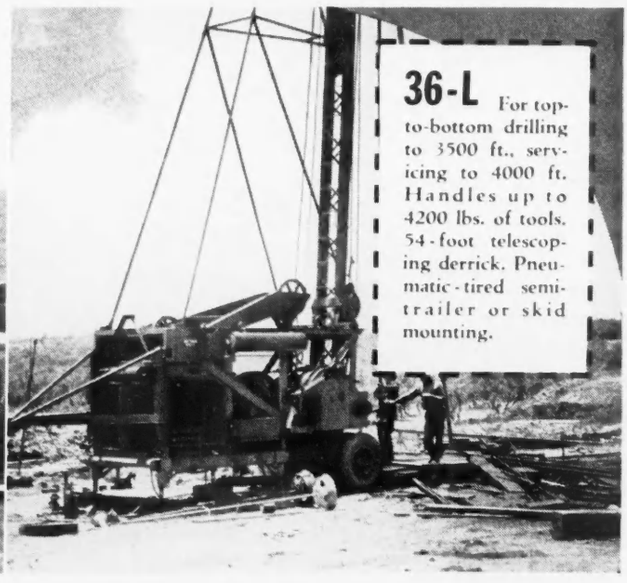

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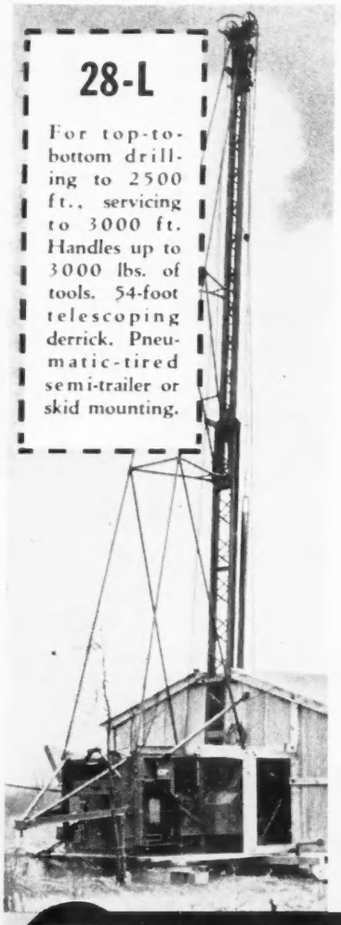

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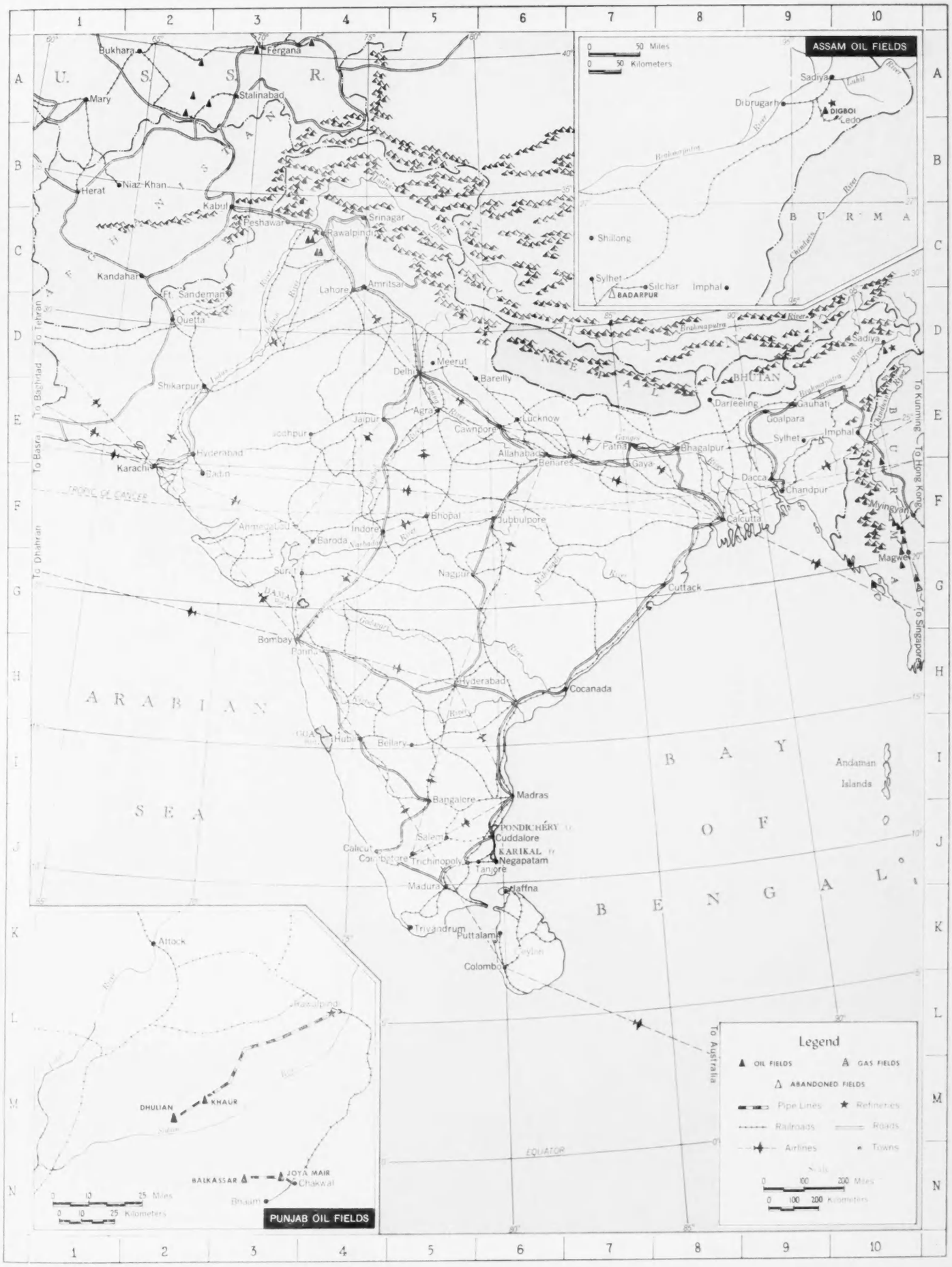
INDIA—Assam and Punjab Fields



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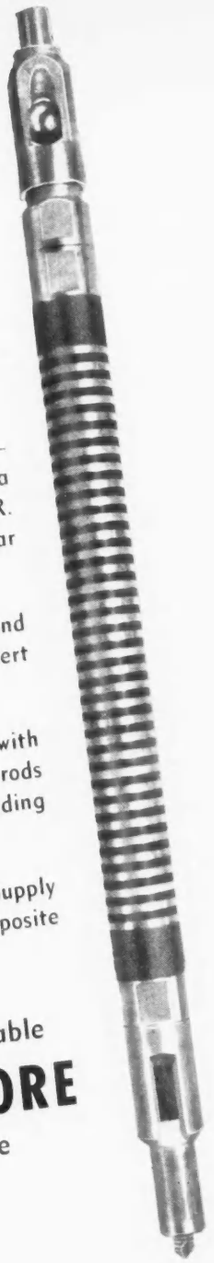

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INDIA

INDIA'S wildcat drilling campaign in 1946 resulted in the discovery of Eocene limestone production in the Balkassar area, 12 miles west of the Joya Mair field, in the Province of Punjab. This test by Attock Oil Company, a British concern, was drilled to 8400 feet and production is from about 8200 feet. The oil, though asphaltic, is a better quality than the 19-gravity crude produced at Joya Mair. Attock is continuing to test the potentialities of the discovery and a second test is planned this year.

The Joya Mair field, discovered in May, 1944, by the Attock company, on an extensive anticline about 30 miles southeast of the older Khaur field, produces very viscous and asphaltic oil and the technical difficulties of handling and treating the oil have been great. A second producer has been completed in Eocene limestone at about 7000 feet. A third test was still drilling at the end of the year at a depth of 8400 feet and is being carried deeper before attempts are made to flow the well from the upper strata by acid or other means.

Burmah Oil Company holds a concession adjoining the Attock discovery and are currently drilling a wildcat test which is near 8000 feet.

Punjab Area

The first oil discovery in the Punjab was the shallow Khaur field, opened in 1914 by the Attock company at about 500 feet. The structure is an anticline with the production being from the Miocene and Eocene formations. The gravity of the oil is 35 degrees (API). The producing horizons of the field range down to 5000 feet. At the end of 1946 the field had 350 producing wells with all but one on artificial lift.

The Dhulian field is the largest producing area in the Punjab although it has only 35 producing wells, all flowing. This field is located about 10 miles southeast of Khaur on an anticline. The oil is 36.8 gravity (API) and is produced from limestone in the Eocene formation just below 7000 feet. During 1946 two oil wells were completed here with the total footage some 15,000 feet.

Production from Punjab fields during 1946 amounted to 295,293 barrels, all from the Khaur and Dhulian fields. This compares with 324,870 barrels produced in 1945 and represents a continued decline since 1941. Annual output in recent years in the Punjab was 1939—757,744 barrels; 1940—767,302 barrels; 1941—885,780 barrels; 1942—780,721 barrels; 1943—594,845 barrels; 1944—410,864 barrels.

Recent Wildcats Completed in India

District	Company, Well, Location	Date Completed	Total Depth (Feet)	Results
Punjab	Attock Oil Company's Bokra 1	1945	6000	Dry
Punjab	Attock Oil Company's Meyol 2	1945	10500	Dry
Punjab	Attock Oil Company's Joya Mair 2.	1946	8400	Small oil, still testing.
Punjab	Attock Oil Company's Balkassar 1.	1946	8400	Discovery well of Balkassar field. Flowed 350 barrels daily from Eocene.
Punjab	Burmah Oil Company's No. 1 well, north of Joya Mair field.		7000	Still drilling.

Engineering and Geological Data on India's Oil Fields

				PRODUCING FORMATION			
Dist. and Field	Est. Proved Area (Acres)	Gravity of Oil API	Kind	Geologic Age	Depth of Wells (Ft.) Minimum Top Pay	Depth of Wells (Ft.) Maximum Total Depth	Type Structure
Assam District:							
Digboi	200	35.8	Sand	Miocene	500	5000	Anticline
Punjab District:							
Khaur	100	35	Sand	Miocene and Eocene	n. a.	5000	Anticline
Dhulian	900	36.8	Lime	Eocene	n. a.	7000	Anticline
Joya Mair	n. a.	19	Lime	Eocene	n. a.	7000	Anticline
Balkassar	n. a.	20	Lime	Eocene	n. a.	8000	Anticline

n.a. denotes information not available.

Assam District

Besides the Punjab, oil in India is produced in the Assam district, also operated by British companies. Drilling and production began in Assam as early as 1888.

The only field presently producing in this area is Digboi which is operated by Assam Oil Company, Ltd., the controlling interest in which is held by Burmah Oil Company. Situated in the Lakhimpur region of Upper Assam, the Digboi structure is a sharply folded anticline. The field produces 35.8-gravity (API) oil from Miocene sand at depths from 500 to 5000 feet.

To date, about 700 wells have been drilled in Digboi with about 200 of these wells now on production. During 1946 the output totaled 1,870,000 barrels or about 5000 barrels daily.

Badarpur field was developed on a small scale by Badarpur Oil Company, which was taken over by Burmah Oil Company in 1915. More than 60 wells were drilled in this area, located in the eastern part of Surma Valley, but now all are abandoned. This anticline is a small dome having a steep, faulted eastern flank. The decline in production was rapid and the wells produced a great amount of water.

Refineries and Pipe Lines

Three refineries, including a small topping plant in the Dhulian field, are operating in India. The larger two plants are located at Digboi and Rawalpindi. The Digboi plant is operated by Assam Oil Company on crude from the Digboi field. The plant has a crude charging capacity of 8100 barrels daily, including a cracking capacity of 2100 barrels.

The Rawalpindi refinery is operated by Attock Oil Company and is served by a 52-mile pipe line from the Dhulian and Khaur fields. The company now is preparing to lay a 34-mile line from its Joya Mair field to the refinery. The capacity of the plant is 6500 barrels daily, including a cracking capacity of 2500 barrels.

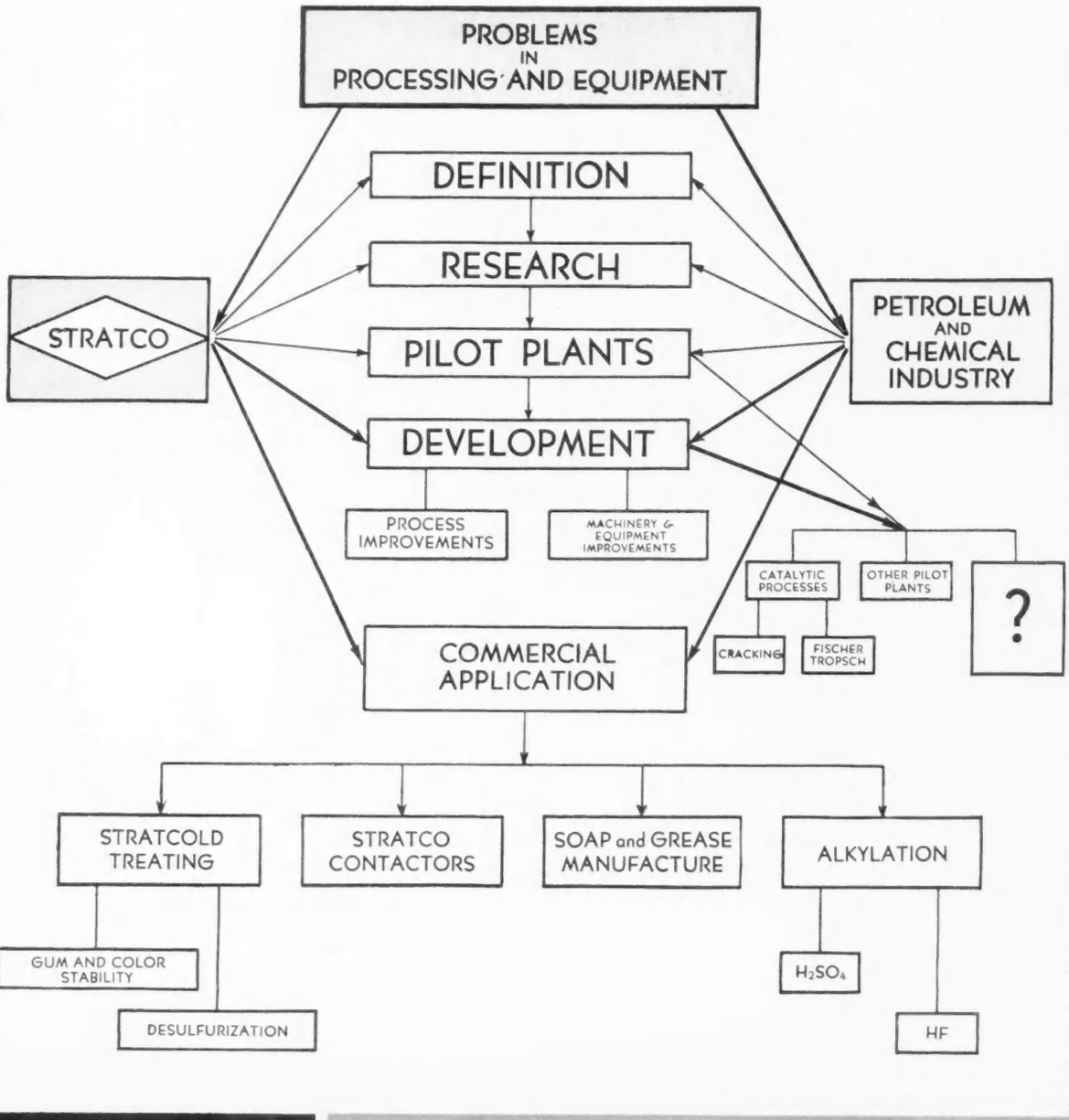
Drilling in the Punjab

	WELLS COMPLETED IN 1946				
FIELD	Oil	Gas	Dry	Total Wells	Total Footage
Dhulian	2			2	15,000
Khaur					
Joya Mair	1			1	8,400
Balkassar	1			1	8,400
Total	4			4	31,800

Punjab Producing Wells and Oil Production

		OIL WELLS AT END OF 1946				CRUDE OIL PRODUCTION (Barrels)	
			Producing				
FIELD	Year of Discovery	Shut in	Flowing	A-L Lift	Total Producing	Year 1945	Year 1946
Khaur	1915		1	349	350	324,870	295,293
Dhulian	1937		35		35		
Joya Mair	1944	3					
Balkassar	1946	1					
Total		4	36	349	385	324,870	295,293

COOPERATIVE PROGRESS



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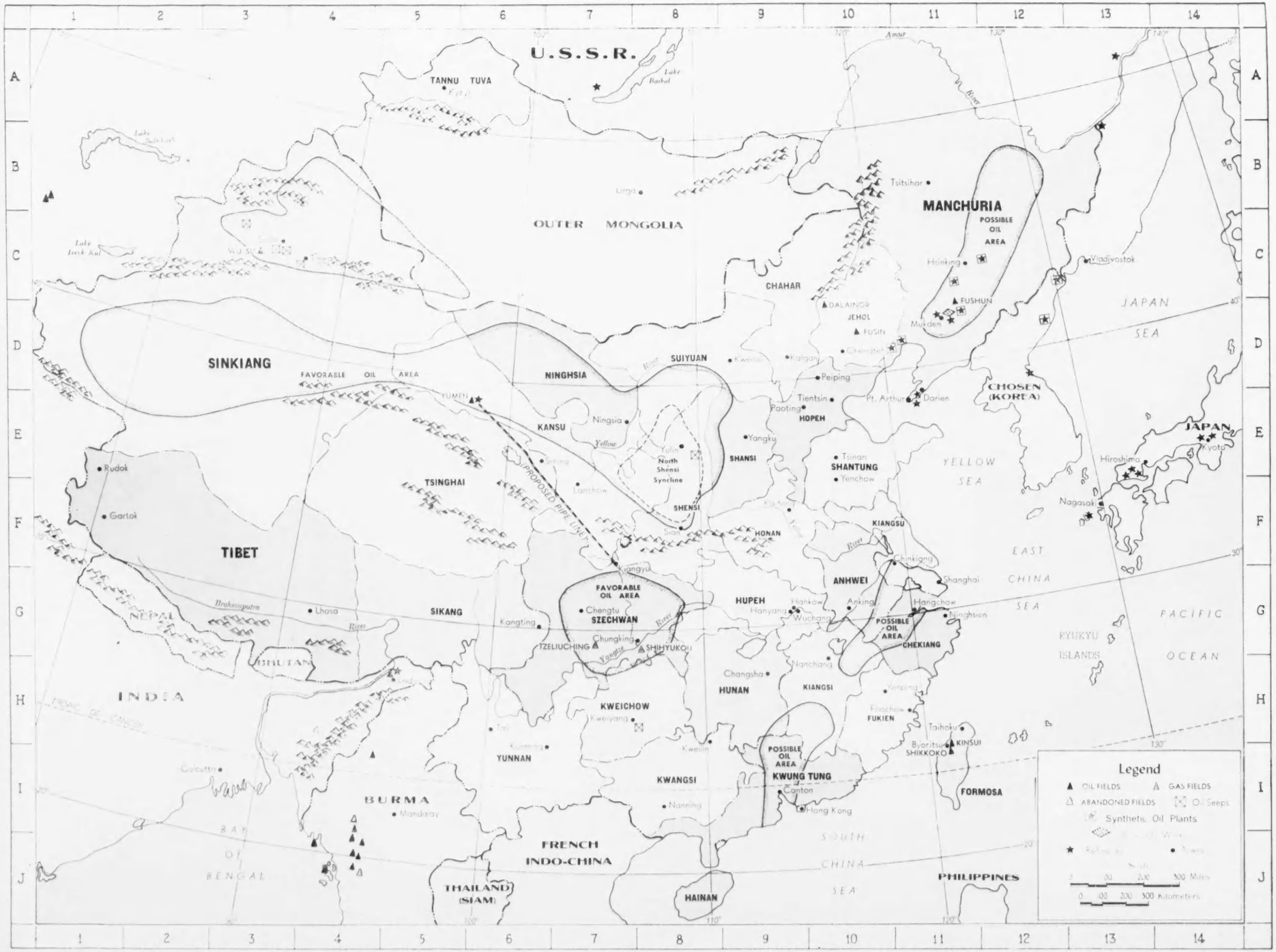
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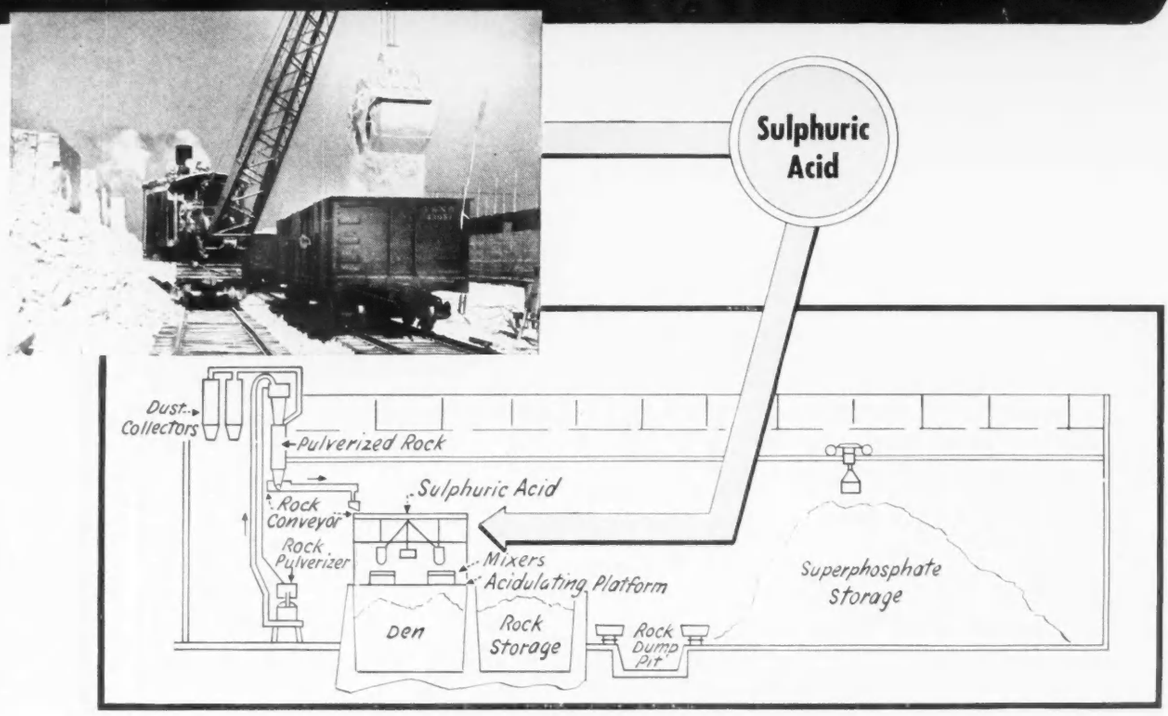
TANNU TUVA
OUTER MONGOLIA
MANCHURIA
POSSIBLE OIL AREA
CHAHAR
DALAINOR
JEHOL
FUSIN
FUSHUN
SINKIANG
FAVORABLE OIL AREA
NINGHSIA
SUIYUAN
KANSU
SHANSI
HOPEH
SHANTUNG
CHOSEN (KOREA)
JAPAN SEA
YELLOW SEA
EAST CHINA SEA
PACIFIC OCEAN
RYUKYU ISLANDS
JAPAN
TSINGHAI
TIBET
SHENSI
HONAN
KIANGSU
ANHWEI
HUPEH
SIKANG
SZECHWAN
FAVORABLE OIL AREA
CHEKIANG
POSSIBLE OIL AREA
HUNAN
KIANGSI
FUKIEN
KWEICHOW
YUNNAN
KWANGSI
KWUNG TUNG
POSSIBLE OIL AREA
FORMOSA
BURMA
INDIA
NEPAL
BHUTAN
FRENCH INDO-CHINA
THAILAND (SIAM)
HAINAN
PHILIPPINES
BAY OF BENGAL
SOUTH CHINA SEA
PROPOSED PIPE LINE
Legend
OIL FIELDS
GAS FIELDS
ABANDONED FIELDS
Oil Seeps
Synthetic Oil Plants
Refineries
Towns
Miles
Kilometers

CHINA

HOW SULPHUR SERVES INDUSTRY



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{ Superphosphate }

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CHINA

CHINA'S crude oil production, which comes mainly from the Yumen field in Kansu Province, is reported to have declined sharply during 1946 because of materials shortages.

The Yumen field, 50 miles west of Suchow and 16 miles south of the old Silk Road, Kansu's principal highway, is under direction of the Chinese Petroleum Corporation. It was discovered in 1939 and currently has about 12 producing wells. Shanghai reports only seven wells on production with the field's daily output between 1200 and 1400 barrels.

Producing horizons at Yumen range from 375 to 2160 feet. Using an average sand thickness of 83 feet and figuring on 60 percent ultimate recovery, the field should produce more than 45½ million barrels of oil from the presently proved area of about 600 acres. Cumulative production through 1946 was about 2 million barrels.

Located at Yumen is a topping plant with a capacity of about 3000 barrels daily. Shipments from the field to outside areas is handicapped by the lack of transportation; so the plant's current output is consumed locally.

The Tzeliutsing gas field, in Szechuan Province, in central western China bordering on the highlands of Tibet, is the site of perhaps the oldest commercial gas field in the world. The gas is found in wells drilled for brine, the gas being used as fuel in the manufacture of salt. Gas production has also been developed at Shihyoukow and at Shentungshan.

China's first oil discovery was the Wu Su field in northwest Sinkiang Province. Exploration and drilling were carried out by Russian engineers and crews. The Russians are credited with having left the area in 1943, taking field installations with them. However, they turned over to the Chinese about 25 producing wells that had been capped and left for future operation. The wells are said to have produced 49-52-gravity oil from depths averaging about 4800 feet.

The Japs are credited with having developed seven producing structures on the island of Formosa (Taiwan). They are Shikukoko, Kinsui and Chikuto, near the town of Byoritsu in the northern sector of the island, and Gyuzan, Rokusyukei, Chikutozaki, and Toshikyaku, in the Sin Yen district of the southern half. Some 225 wells have been drilled in these areas with 145 completed as oil or gas producers. Twenty-five wildcat tests have been drilled on 12 surface structures to depths from 825 feet to 9900 feet, but were failures. Of the seven structures, only Shikukoko, Kinsui, and Chikuto have produced oil in commercial quantities. Under Jap operation, the three fields produced an average of 90 barrels daily. Depths of the producing wells range from 300 feet to about 11,500 feet.

The Chinese government is operating a 15,000-barrel former Jap refinery on Formosa.

JAPAN

CRUDE oil production in Japan during 1946, although higher than in 1945, failed to reach its goal of 1,572,500 barrels, according to a report of the Military Government. The report, covering the first nine months of 1946, showed that production totaled 1,069,300 barrels and pointed out that the scheduled output for the year probably would not be reached. Output in 1945 is estimated at a million barrels.

Japanese oil flow was hampered during the year by a workers' strike against Imperial Oil Company, Japan's largest oil company. The strike resulted in an output of 98,696 barrels in September compared with a peak of 131,731 barrels in August.

At the end of September, 1946, the petroleum exploitation program in Japan was from two to three months behind schedule. Lack of cash, lack of transportation to remote drilling sites and particularly food and labor shortages are affecting the oil industry.

Completion of five new wells brought Japan's production up to 28,959 barrels weekly in July, almost reaching the military government's mark set at 30,000 barrels a week. Most of the new production upon which the military government depends to bring Japanese oil output above the 30,000-barrel weekly mark is expected from the Hachimori field in Akita Prefecture, where a well completed during the year by Nitto Oil Company had an initial flow of 600 barrels daily.

Japan's peak prewar production period was between 1935-1939 when output averaged almost 2½ million barrels annually. This did not include oil produced by Japanese companies in southern Sakhalin.

Producing Districts

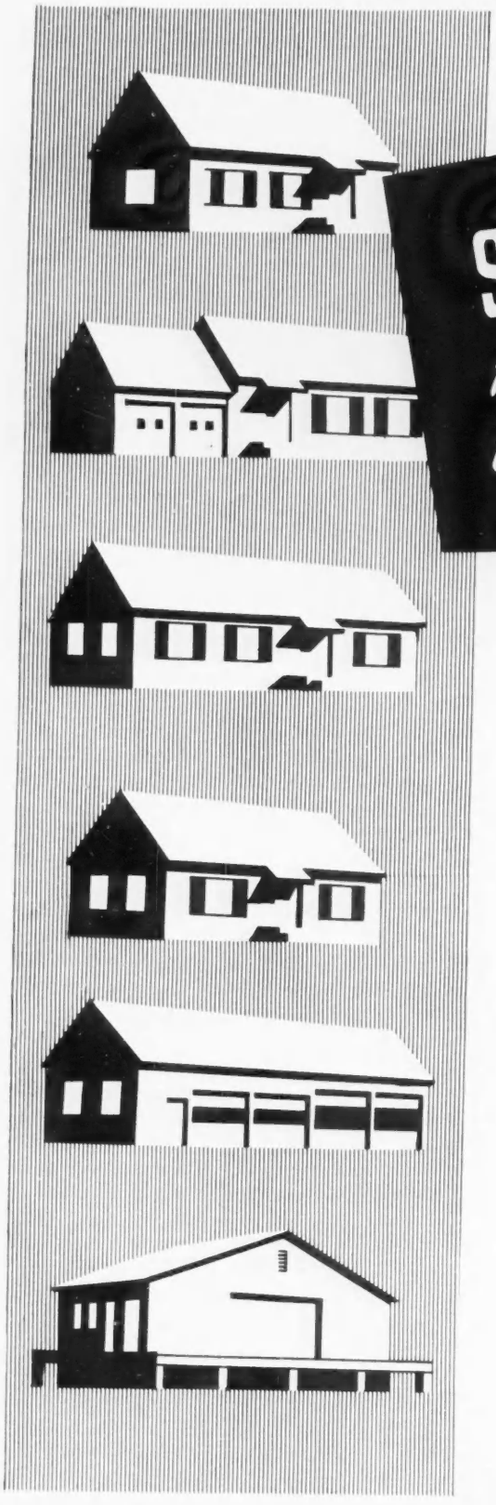
Japanese home island oil fields are centered on about a north-south line running from the north tip to the southern part of Hokkaido Island, and along the west coast of Honshu Island. There are four principal producing areas in Japan—Hokkaido, Akita, Yamagata and Niigata. The latter three areas are located on Honshu Island. The largest of these areas is Akit, which also is a refining center.

The military government's latest available report revealed that seven fields were in production. The fields and their monthly production figures were listed as follows: Akita, 52,118 barrels; Kashiwasaki, 24,865 barrels; Yamagata, 22,826 barrels; Hokkaido, 1583 barrels; Niitsu, 1461 barrels; Niigata, 556 barrels, and Hachimori, 553 barrels.

There are presently about 4850 producing wells in Japan with about 2550 being located in the Niigata district. Producers in the Akita and Yamagata districts total about 1600 while Imperial Oil Company has 444 wells in the Hokkaido sector. Most of the current drilling is in the Akita and Yamagata districts. All of the wells in Japan are shallow, the average depth being about 3200 feet. Because of the lack of drilling equipment, new activity is confined to the producing areas, with no great amount of wildcatting being undertaken.

Data on Refineries of Japan

COMPANY	Location of Plant	Crude Charging Capacity Bbls. Daily	Operating Status
Nippon Oil	Hokkaido	504	Operating
Nippon Oil	Akita	1021	Operating
Nippon Koiyo	Funkawa (Akita)	2520	Operating
Showa Oil	Hirasawa (Akita)	882	Operating
Nippon Oil	Niigata	2646	Operating
Showa Oil	Niigata	2835	Operating
Showa Oil	Sekiya (Niigata)	605	Operating
Nippon Oil	Kashiwasaki (Niigata)	1260	Operating
Showa Oil	Kawasaki (Kanagawa)	6552	Operating
Nippon Oil	Yokohama (Kanagawa)	7056	Operating
Koa Oil	Yokohama (Kanagawa)	700	Operating
Toa Nenryo	Shimizu (Shizuoka)	1890	Operating
Daikyo Oil	Yokkaichi (Mie)	2331	Operating
Maruzen Oil	Osaka	63	Operating
Toa Nenryo	Wakayama	6300	Operating
Showa Oil	Kainan (Wakayama)	926	Operating
Koa Oil	Marifu (Yamaguchi)	6300	Operating
Maruzen Oil	Maytsuyama (Chime)	1764	Operating
Maruzen Oil	Imafuku (Nagasaki)	126	Operating
Total	19 Plants	46,281	



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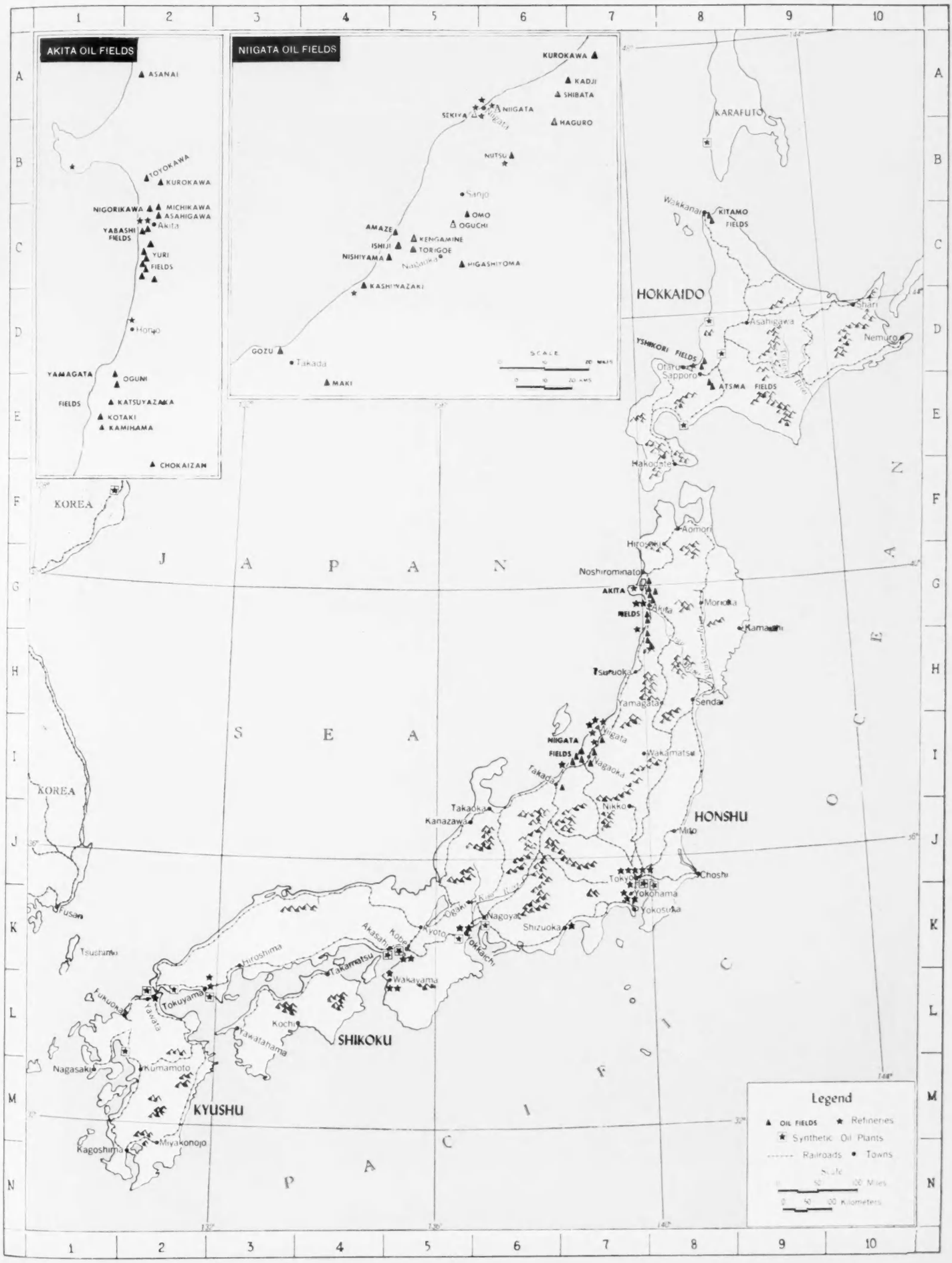
JAPAN


AKITA OIL FIELDS
ASANAI
TOYOKAWA
KUROKAWA
NIGORIKAWA
MICHIKAWA
ASAHIGAWA
Akita
YABASHI FIELDS
YURI FIELDS
Honjo
YAMAGATA FIELDS
OGUNI
KATSUYAZAKA
KOTAKI
KAMIHAMA
CHOKAIZAN
NIIGATA OIL FIELDS
KUROKAWA
KADJI
SHIBATA
NIIGATA
SEKIYA
HAGURO
NUTSU
Sanjo
OMO
OGUCHI
AMAZE
KENGAMINE
ISHIJI
TORIGOE
NISHIYAMA
HIGASHIYOMA
KASHIWAZAKI
GOZU
Takada
MAKI
SCALE
KOREA
JAPAN
SEA OF JAPAN
KARAFUTO
HOKKAIDO
Wakkanai
KITAMO FIELDS
Asahigawa
Shari
Nemuro
YUBARI FIELDS
Otaru
Sapporo
ATSUMA FIELDS
Hakodate
Aomori
Hirosaki
Noshiromina
AKITA FIELDS
Akita
Morioka
Kamaishi
Tsuruoka
Yamagata
Sendai
NIIGATA FIELDS
Niigata
Wakamatsu
Nagaoka
Takada
Takaoka
Kanazawa
Nikko
HONSHU
Mito
Choshi
Tokyo
Yokohama
Yokosuka
Nagoya
Shizuoka
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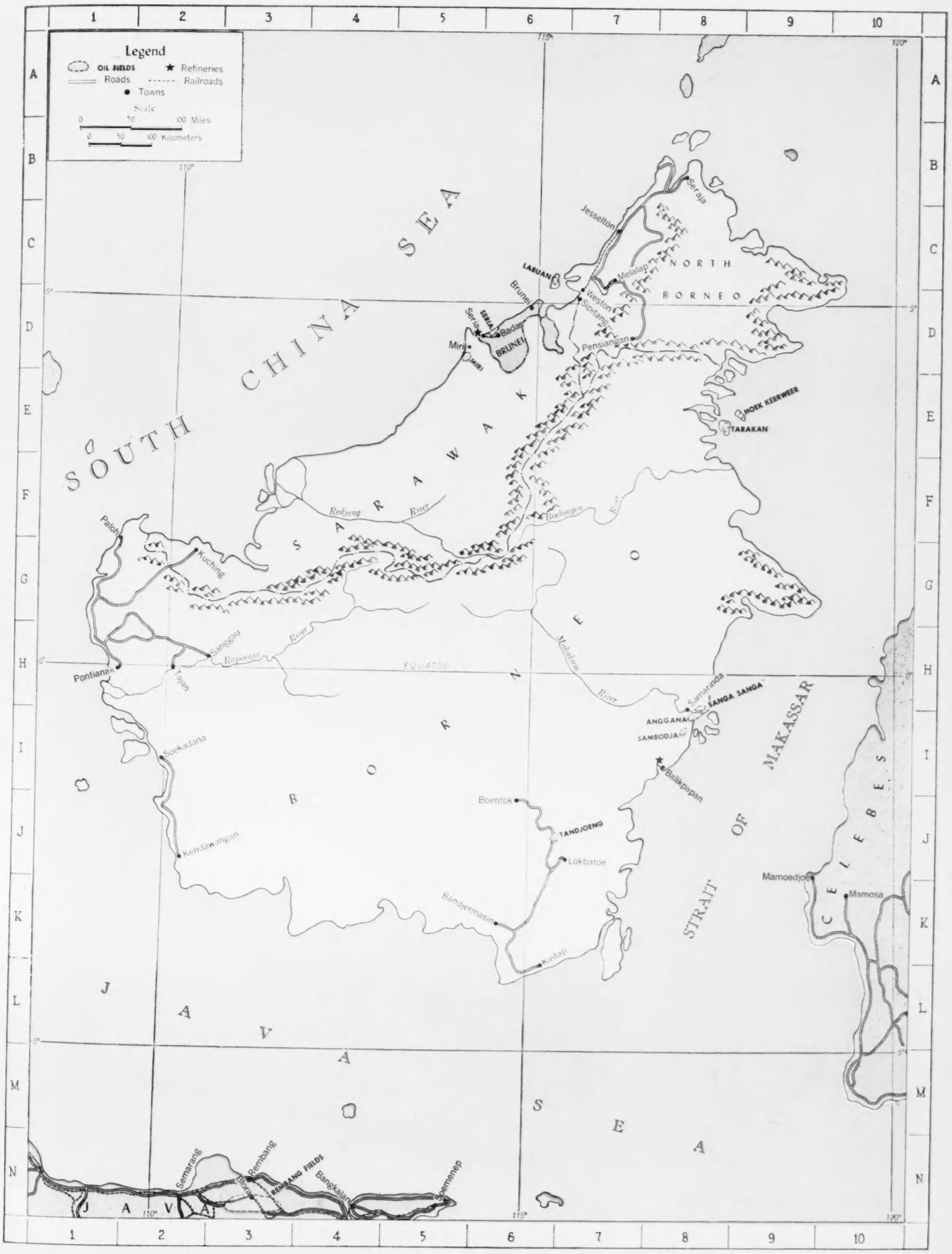
EAST INDIES—Borneo, Brunei and Sarawak Fields



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EAST INDIES

LITTLE authentic information has been released regarding the status of the oil fields of the East Indies, which were so seriously ravaged during World War II.

Since the end of the war some rehabilitation work has been carried out both in the fields and refineries. Estimated production of fields in the Netherlands East Indies for 1946 is 10,120,500 barrels while estimated output of British Borneo (Sarawak and Brunei) has been placed at 3.5 million barrels. This gives the East Indies an estimated production of 13,620,500 barrels for 1946 as compared with an actual output of 69,058 barrels in 1940, the year prior to the beginning of the war. In 1941, production for East Indies was 60,564 barrels while production in 1942, under Japanese occupation, is reliably reported at 15,750 barrels. There are no definite figures for the production during the years 1943-45.

Three major oil companies operate in the East Indies: Bataafsche Petroleum Maatschappij (Royal Dutch-Shell), Nederlansche Koloniale Petroleum Maatschappij (subsidiary of Standard-Vacuum Oil Company which is owned equally by Standard Oil Company (New Jersey) and Socony-Vacuum Oil Company), and Nederlandsche Pacific Petroleum Maatschappij (owned jointly by Standard Oil of California and The Texas Company). All three operating companies have an interest in Nederlandsche Nieuw Guinee Petroleum Maatschappij, which operates in the Netherlands part of New Guinea. The Netherlands Indies government and BPM have an equal interest in Nederlandsche Indische Aardolie Maatschappij.

BPM has productive fields on the islands of Sumatra, Java, Borneo and Ceram. NKPM has producing fields in Sumatra and Java. NPPM entered the Netherlands East Indies in 1931, and, although it found commercial quantities of oil on two structures in central Sumatra shortly prior to the Japanese invasion, developments had not reached a commercial stage.

Many millions of dollars are earmarked for exploration work in New Guinea. The island consists of three main political divisions. The northwestern half is part of the Netherlands East Indies, while Papua (formerly British New Guinea) occupies the southern part of the southwestern end, the northern section of which was once a German colony and is now under Australian mandate.

The search for oil in the British half of the island began in 1912, when the government started exploration in the Vailala River district of Papua. Nine wells, most of them shallow, had yielded a small quantity of high-grade crude before drilling difficulties caused a suspension of operations in 1919. A survey of the Gulf of Papua area was carried out for the British and Australian governments in 1920 by Anglo-Iranian Oil Company. Prior to the war development work was started by Australasian Petroleum Company, an Australian undertaking in which Anglo-Iranian and Standard-Vacuum hold considerable interests, with the other partner being Oil Search, Ltd., of Sydney, Australia.

The work carried out by Australasian Petroleum Company consisted of an air survey covering 28,000 square miles, followed by geophysical exploration of selected areas and the drilling of a wildcat test at Kariava, near the Vailala River, some 75 miles from the Gulf of Papua. This test had reached about 5000 feet when it was halted by the Japanese invasion. Work has been resumed and the test now is drilling below 7000 feet. Projected depth is reported to be 10,000 feet.

Developments also have been taking place in Dutch New Guinea where Nederlandsche Nieuw Guinee Petroleum Maatschappij has a concession of some 32,000 square miles. This company had discovered oil in paying quantities on several structures in the Vogelkop area when the war interrupted operations.

The structures where oil had been discovered before the war are Klamono, Wasian and Mogoi. These discoveries have proved an area about 200 miles long and from 40 to 70 miles wide.

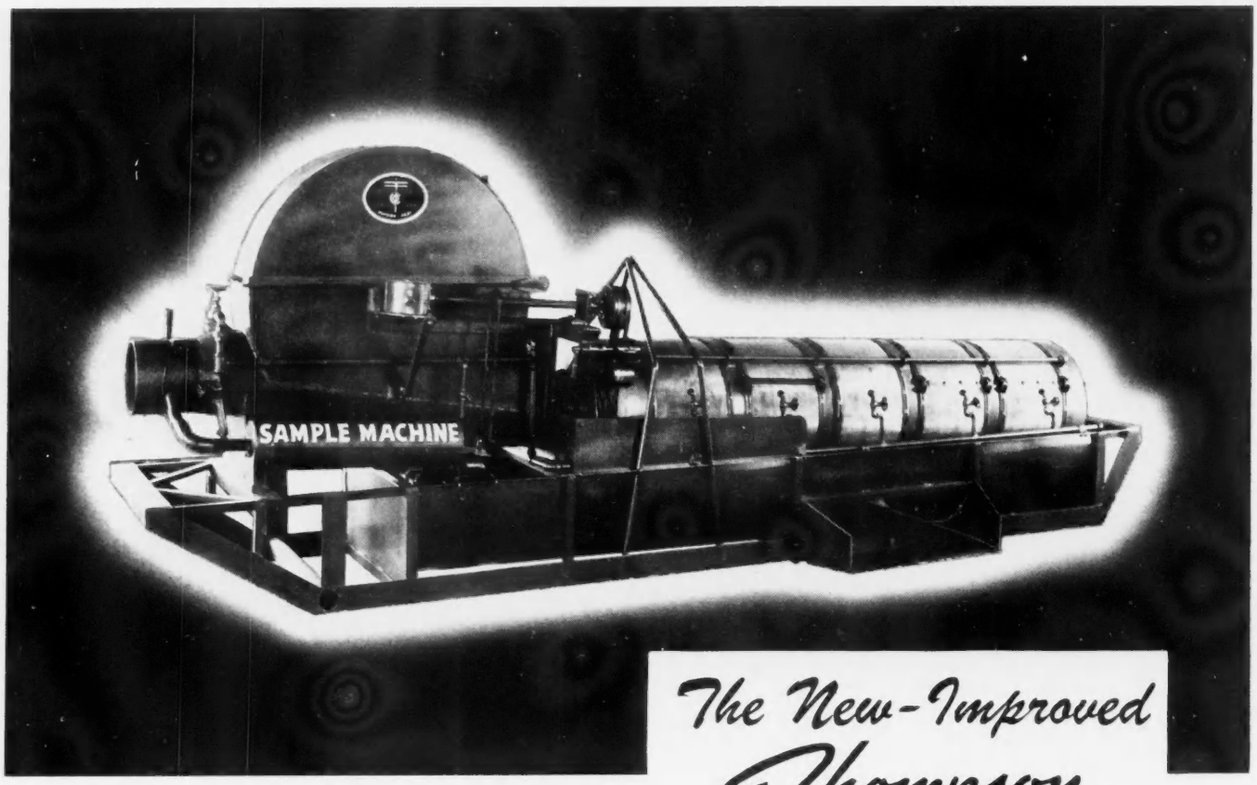
Fourteen shallow wells have been drilled on the Klamono structure, eight of which were productive. The oil is asphaltic, being 18.8-gravity (API). At Wasian, two wells were drilled and found oil in the top of a limestone section in the Miocene at 3100-3225 feet. Oil is paraffinic and has a gravity of 47.6-degrees (API). At Mogoi, the Miocene limestone was reached at 1873 feet in the only test drilled on this structure. A preliminary rating showed this well to be good for about 600 barrels daily.

Rehabilitation

Prior to Japanese conquest many wells in the East Indies were plugged or decommissioned by other means, and pipe lines, pumping equipment, storage tanks, refineries and other

Engineering and Geological Data on East Indies Oil Fields

ISLAND, FIELD	Range of Gravity of Oil (API)	PRODUCING FORMATION			Depths of Wells (Ft.)		Average Thickness of Pay (Feet)	Type Structure
		Name	Kind	Age	Minimum Top Pay	Maximum Total Depth		
Sumatra:								
Pase	50		Shaly sands	Pli. Mio.		2000	80-250	Anticline
Pangkalan Fields (P. Soesoe, Rantau, Serangdjaja, Perlak	48 to 55.5		Shaly sands	Pli. Mio.	350	4200	10-1000	Anticline faulting
Mangoendjaja Fields (Soeban, Boeroeng, Babat, Karang, Ringin)	23.6 to 27.7	Palembang Telissa	Shaly sands	Miocene	430	2000		Anticline faulting
Palembang, Fields (Talang Akar, Djirak, Benakat, Limau, Talang, Djimar)	43 to 45.4		Shaly sands	Pli. Mio.	140	2600		Anticline faulting
Moeara Enim Fields (Soeban-Djeriji, Tandjoeng-Loentar	45 to 55	Palembang Telsisa	Shaly sands	Pli. Mio.	350	4500		Anticline faulting
Djambi Fields (Ketuali Asam, Tempino, Badjoebang, Betoeng)	40	Palembang Telissa	Sandy shale	Pli. Mio.	2650	2974		Anticline faulting
Kloeang	43.2	Palembang Telissa	Sandy shale	Miocene	500	2600		Anticline faulting
Java:								
Rembang Fields (Kawengan, Ledok, Nglobo)	31.3 to 46	Globigerina L., Rembang	Shaly sands	Pli. Mio.	1900	3000		Anticline faulting
Soerabaja Fields (Kroeka)	25.7	Globigerina	Shaly sands	Pli. Mio.	164	1400		Anticline faulting
Ceram:								
Boela	22.5	Boela	Sand shale	Pli. Tri.	240 to 1000	260 to 1020		Faulted Anticline
New Guinea:								
Klamono	18.8		Lime	Miocene	300			Anticline
Wasian-Mogoi	47.6		Lime	Miocene	1870	3225		Anticline
Sarawak:								
Miri	17.9 to 47.4	Miri	Sand	Miocene	130 to 5564	340 to 5790		Faulted Anticline
Brunei:								
Seria	18.1 to 32	Seria Miri	Sand shale	Miocene	500 to 2500	2000-3300		Faulted Anticline
Borneo:								
Samarinda Fields (Sambodja, Sanga Sanga, Anggana)	17.4 to 33		Sandy shales	Pli. Mio.	165	2500		Faulted Anticline
Tarakan	18.2	Tarakan	Sand	Pli. Mio.	210-2600	230-2620		Dome, Anticline with faulting



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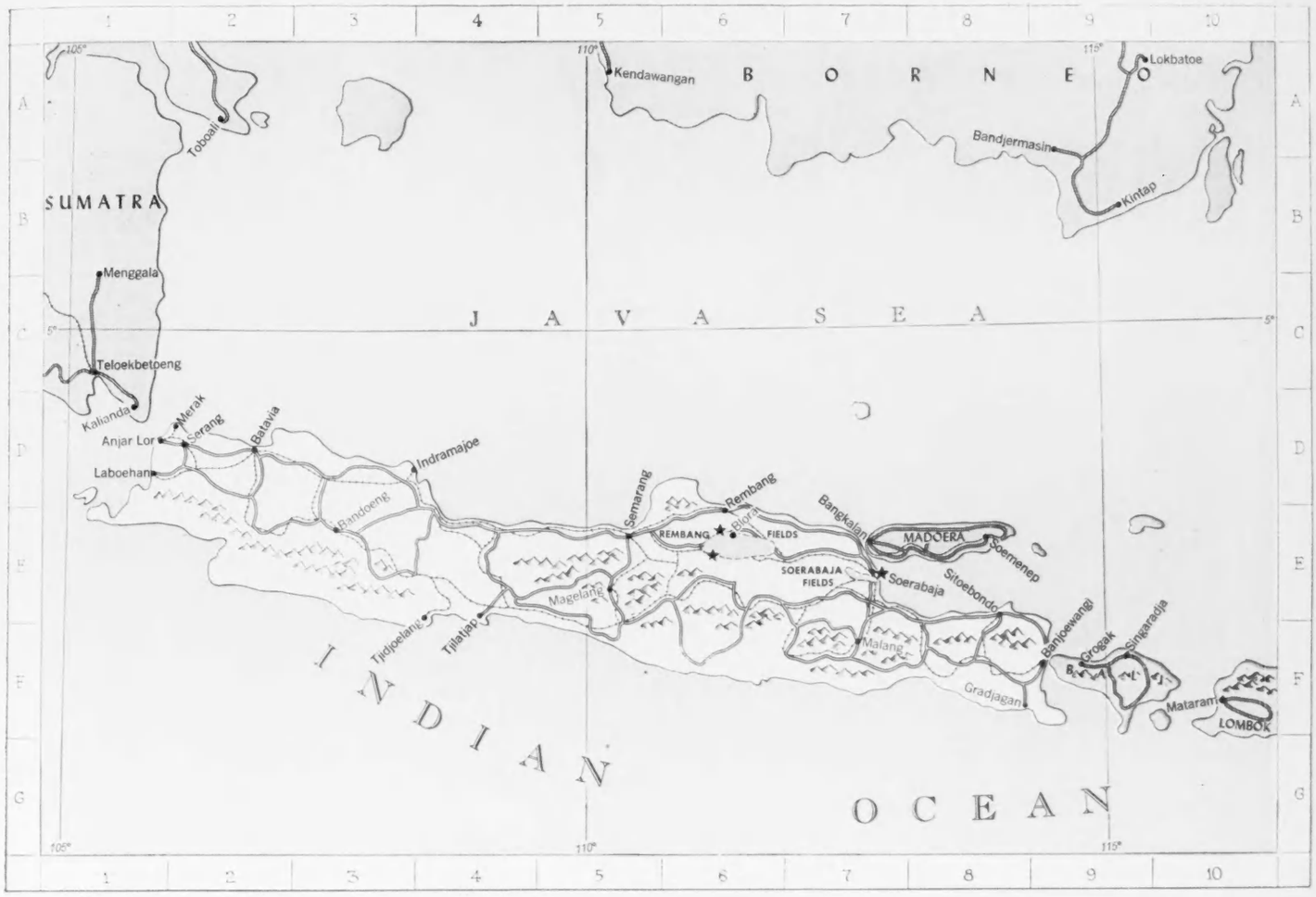
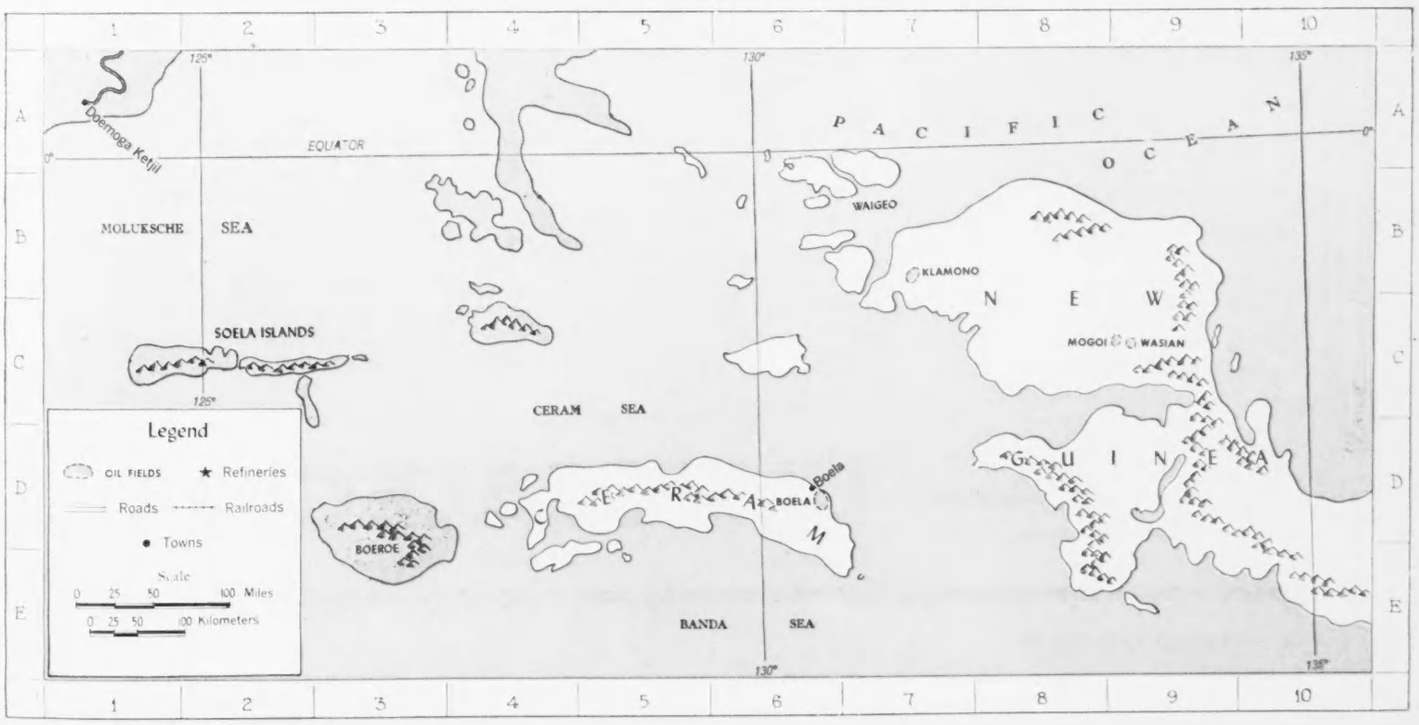
EAST INDIES—Java Fields



Ceram and Netherlands New Guinea Fields



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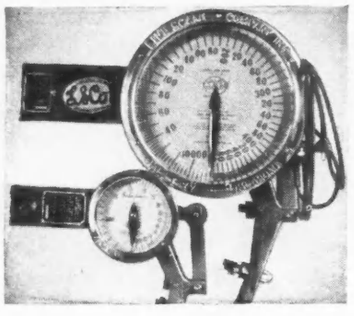

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equipment were generally destroyed. Information regarding the exploration and rehabilitation of the oil fields and refineries during Japanese occupation is meager. Almost immediately after their capture the Japanese boasted that the oil fields were again in operation. Their statements, in the light of present available data, were grossly exaggerated.

The oil fields of Seria and Miri, in British Borneo, were recaptured from the Japs in July, 1945. The enemy in his retreat had fired the flowing wells at Seria and blown up all major installations. By the end of September, 1945, all fires had been extinguished and rehabilitation in the fields was underway. Drilling was resumed early in 1946 and regular shipments of crude oil from the area began in March, 1946. Estimated daily production at the end of 1946 was about 11,000 barrels.

Restoration of production in the Tarakan field, off the east coast of Dutch Borneo, started immediately following the recapture of the field by the Allies in mid-1945 and at the end of 1946 daily output was estimated at 5000 barrels or about one-third the prewar daily flow. Prior to the war, the field was producing about 15,000 barrels daily from 580 wells. The characteristics of the oil is such that it can be used as diesel or underboiler fuel after a simple dehydrating process. The Japs are credited with having drilled 173 new wells. Production under Japanese occupation has been estimated at 5 million barrels.

The Sanga Sanga, Anggana and Sambodja fields, in the Balikpapan area, on the east coast of Dutch Borneo, produced approximately 19,462 barrels of crude oil daily from about 450 wells prior to the war. These fields were severely damaged during the war and at present eight crews are busy with field rehabilitation. At Sanga Sanga, the Japs had constructed three large earthern reservoirs for crude storage, the contents of which were pumped into tanks after Allied recovery. About 219,800 barrels were recovered in this manner.

The Tandjoeng field, about 104 miles southwest of Balikpapen, was undamaged during the war. This field was opened shortly before the outbreak of the war and since facilities for gathering and transporting oil from the eight flowing wells to the nearest refinery or shipping point had not yet been erected at the time of the Jap invasion, the field was of little use to the enemy, and the wells were left intact.

Information regarding the Beela and Lemoen fields on Ceram is not available. Prewar production of these fields amounted to 2335 barrels of oil daily.

Data on Refineries of East Indies

Company	Location of Plant	Crude Charging Capacity (Barrels Daily)	Cracking Capacity (Barrels Daily)	Type of Refinery	Operating Status
Sumatra:					
Bataafsche Pet. Mij. (Shell)	Pangkalan Brandon	23,000	None	Skimming	
	Pladjoe, Palembang	59,000	2,500	S-C-Lube	Rebuilding
Nederlandsche Koloniale Pet. Mij.	Palembang	45,000	18,000	Complete	Rebuilding
Borneo:					
Bataafsche Pet. Maatschappij (Shell)	Balikapan	41,250	7,400	Complete	Will rebuild
Sarawak:					
Sarawak Oilfields Ltd., (Shell)	Lutong	20,000	None	Skim-Lube	
Java:					
N.V. de Bataafsche Pet. Maatschappij (Shell)	Tjepoe	15,000	600	Skim-Crk	
	Wonokromo	2,500	None	Skimming	Operating
Nederlandsche Koloniale Pet. Mij.	Kapochi	500	None	Skimming	

The oil fields of South Sumatra were put out of commission but the Japs succeeded in restoring production to some extent. So far it has been impossible to investigate the conditions of the wells in that area.

In the Pangkalan Brandan area, on the northeast coast of Sumatra, the Japs obtained their principal production from the prolific Rantau field. The comparatively new field, Paloeh Taboehan, also was tapped rather intensively by the Japs. It is estimated that the Japs extracted about 8,792,000 barrels from all the fields of northeast Sumatra.

The fields in Java also were restored by the Japs and several new wells were drilled in the areas. Production in Java under Japanese occupation is estimated at 3,266,000 barrels annually as compared with a prewar output of 4,503,000 barrels.

Refineries

Prior to the war there were eight refineries operating in the East Indies with a daily crude charging capacity of 197,200 barrels, with an additional cracking capacity of 28,500 barrels daily. All of these plants either were destroyed or severely damaged during the war.

Reconstruction work on Sarawak Oilfields' (Shell) plant at Lutong, British Borneo, was resumed early in 1946.

BPM's refinery at Balikpapan, Dutch Borneo, was destroyed by the operators on January 22, 1942. The refinery was a complete plant with a crude charging capacity of about 48,000 barrels daily. This plant now is being rebuilt and some units are in operation.

When the Dutch returned to the Tandjoeng field, near Balikpapan, they found that a makeshift topping plant had been constructed by the Japs. From disconnected data it appears that the Japs processed at one time about 1000 barrels of crude per month. The topping plant now is being used to make gasoline, kerosine, diesel oil and boiler fuel. A similar primitive topping plant was built by the Japs in the Sanga Sanga field and it is now being adapted to produce gasoline, kerosine and diesel oil.

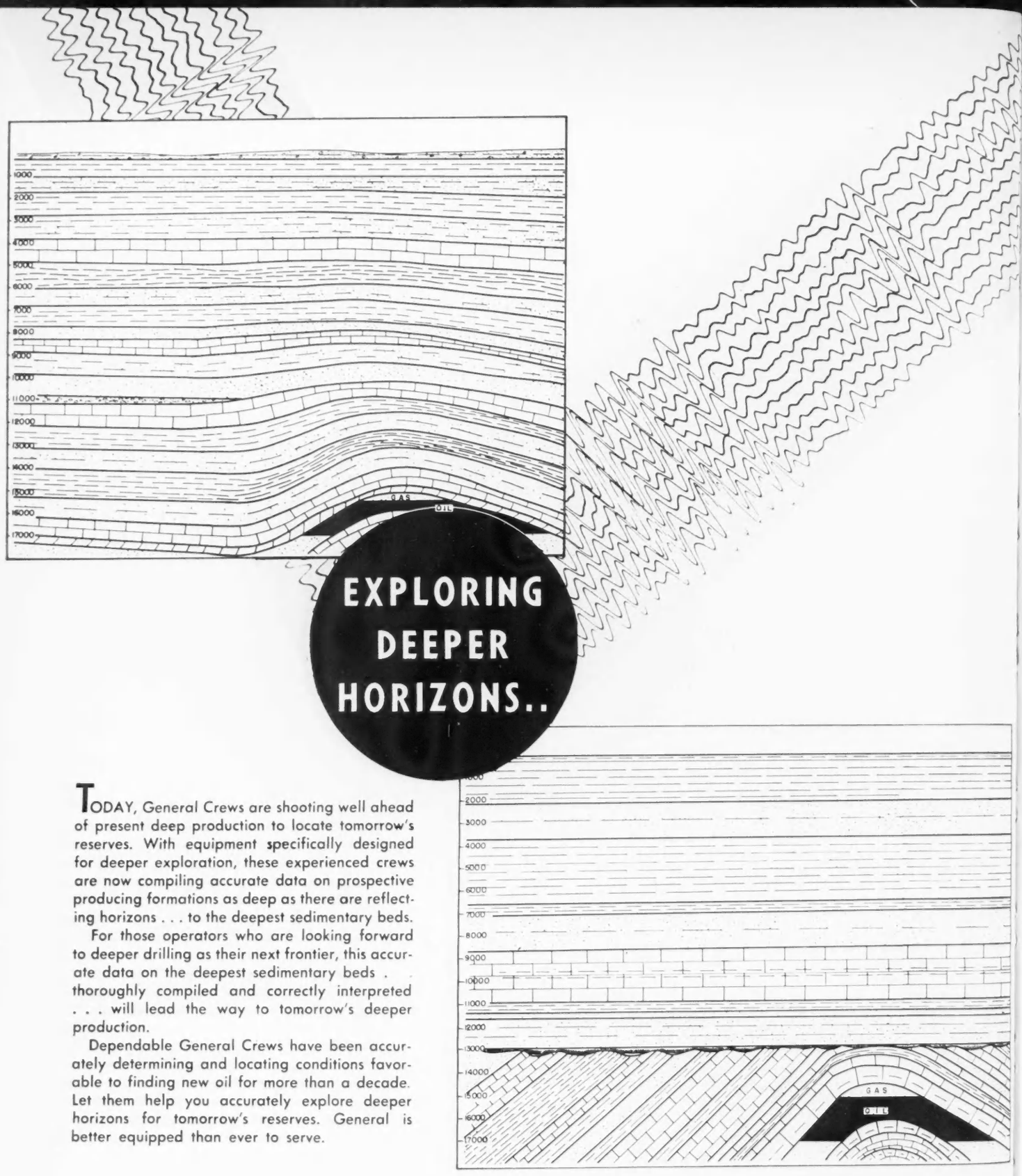
The refineries of BPM and NKPM, located at Pladjoe and Soengei Gerong near Pakenbang, in southern Sumatra, were not destroyed and a good start has already been made toward getting the plants back into shape. BPM's Pladjoe plant had a prewar capacity of about 62,280 barrels daily and has been reduced to about 27,000 barrels daily because of damage. The Soengei Gerong plant of NKPM had a prewar capacity of 45,000 barrels daily.

BPM's plant at Pangkalan Brandan, on the northeast coast of Sumatra, had a prewar capacity of 23,000 barrels daily. This plant was demolished early in 1942. However, reports indicate that the Japs did succeed in restoring production to about 15,000 barrels daily.

Two refineries were operated on Java by BPM and they were either destroyed or removed. The plant at Tjepoe had a prewar capacity of 15,000 barrels and the small plant at Wonokromo had a daily throughput of 2500 barrels daily. NKPM also operated a small plant at Kapoelin.

The operating companies presently are actively engaged in organizing the gigantic task of rehabilitating the destruction caused to both fields and refineries.

Although the East Indies were liberated from the Japanese on August 15, 1945, political difficulties, which arose thereafter, have prevented a proper resumption of work. A settlement between the Dutch and the native government, signed during the latter part of 1946, is reported already beginning to break down.



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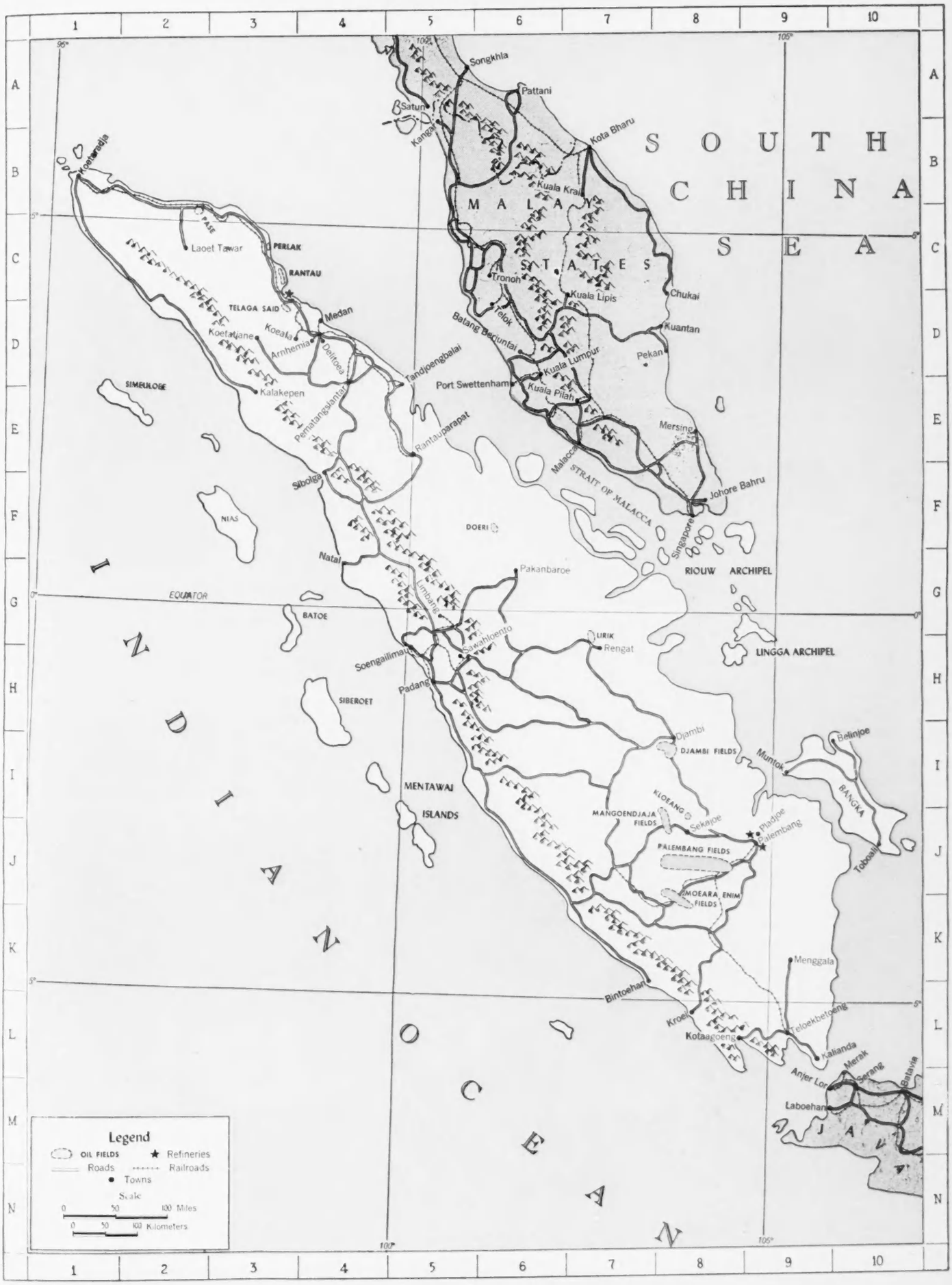
EAST INDIES—Sumatra Fields



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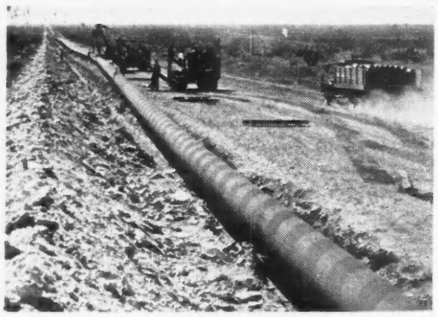
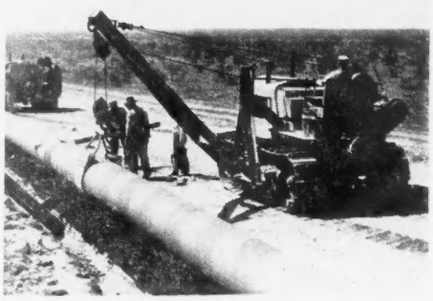


(left and right) Smith "know-how" makes fast progress on 40 miles of 22- and 26-inch main feeder lines for world's largest Carbon Black plant.



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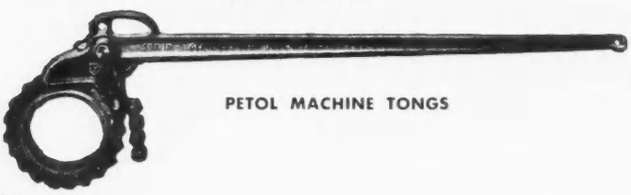

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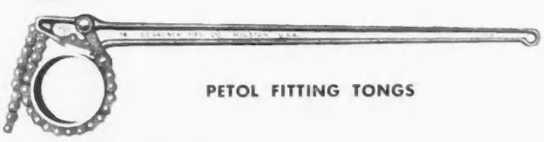

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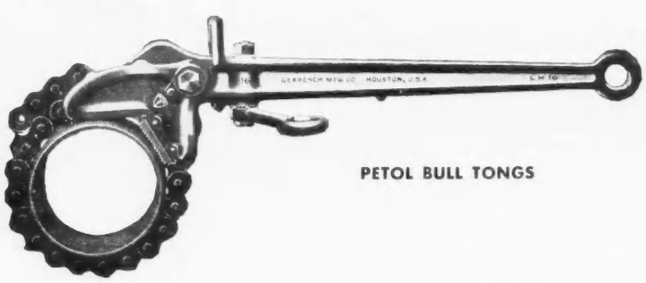

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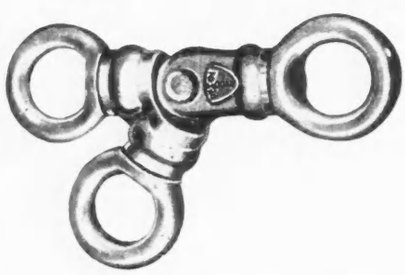

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PHILIPPINE ISLANDS

EFFORTS to establish oil production on the Philippine Islands, interrupted by the war, now are being renewed. Far East Development Company, Inc., a Philippine corporation with headquarters in Manila, has spudded the first of three wildcat tests to be drilled on its concessions.

The first of the three is the Cebu 1-A, located near Bogo on the northern tip of the Island of Cebu about 1000 feet north of a test which was being drilled at the time of the Japanese invasion. The latter test had reached a depth of 8300 feet and orders were issued on December 4, 1941, to start a series of drill stem tests at 8250 feet. Four days later the war began and the rig and camp were destroyed on orders from the Army to prevent the equipment and supplies falling into the hands of the Japanese. The same fate befell a rig in operations at Barili, where, at the time, the test was drilling at 2200 feet in limestone formation.

Drilling of the Cebu 1-A is being contracted by Kern Drilling Corporation of Long Beach, Calif. A diesel-driven rotary outfit with a 136-foot derrick is being used and will be dismantled and moved to each new location. Other than a tool pusher, drillers and one mechanic, crews have been filled up with native labor which will be taught as work progresses.

The wildcat will have basement as its objective unless a discovery is made above this point. Basement is believed to be at a depth of approximately 12,500 feet.

Stockholders of the Far East Development Company include Occidental Corporation, a wholly owned subsidiary of Transamerica Corporation; Standard Oil Company of California and The Texas Company. Far East holds leases covering about 70,000 acres situated in the northern section of Cebu and on the Bondoc Peninsula, on the southwestern tip of the Island of Luzon.

The first serious exploration for oil on the Philippine Islands was made about a quarter century ago by Richmond Oil Company, a subsidiary of Standard Oil Company of California. Five tests, one to a depth below 5000 feet, were drilled at Bondoc but none found commercial oil production.

Geology of Islands

Geologically, the Philippine Islands do not represent a part of the main continental mass of Asia. H. Foster Bain, mining geologist, has declared the Islands to be "a wrinkle in the sea bottom pushed up to the surface in relatively recent geological times." They are situated at the outer edge of the the continental shelf, here covered by a shallow sea which extends west to the China Coast. None of the older rocks found in the neighboring part of China appear in the Philippines. The oldest known are certain ammonite bearing sediments found on the east coast of Mindoro in the course of the recent geological survey. These forms indicate an age at least as early as Cretaceous and may date back to the Triassic. Aside from these rocks all those found in the Philippines are Tertiary or younger, and much the larger portion of the area is underlain by Miocene.

It is possible, but as yet not proven, that older rocks occur on Palawan, the long narrow island which runs southwest and formerly connected the main groups with Borneo. This island has been little studied and minerals and rocks have been brought from it which at least suggest a pre-Tertiary age. The larger part of Palawan, however, shows only Tertiary and recent rocks corresponding in character to those on the other Philippine Islands.

Recent beds cover considerable areas. Both igneous and sedimentary rocks are present. The igneous rocks are represented by a series of lavas and intrusives representing repeated periods of activity. The magmas were dominately basic, ranging from periodities and other ultrabasics, up to granodiorite. The sedimentary rocks are largely terrestial conglomerates, sandstones, tuffs, and shales. Old embayment areas show now as the fine grained shales and coal beds. Limestone, mainly of coral reef type but including orbitoidal and true marine beds, are widespread. The Pliocene deposits are similar in character and the limestones form a continuous sequence from early Tertiary to modern fringing coral reefs.

Government Surveys

With the early oil exploration on the Philippines confined to the shallow drilling by Standard of California, it was determined in 1939 to undertake a comprehensive petroleum geological survey and the financing and administration was placed in the hands of National Development Company, a wholly-owned government corporation. The work was conducted in the closest cooperation with the Bureau of Mines which had been set up by the Commonwealth in 1936 to handle all ordinary matters connected with mineral resources.

The occasion for the organization of the special petroleum survey was the breakdown of the previous system of leasing and development. In 1902 the Philippine Commission promulgated a mining law closely modeled after our own of that time providing for discovery, claim staking and assessment work leading to patent. Petroleum did not attract much attention in the Philippines during this period and the only claims extant for which the title runs back to the old mining law are two or three on Leyte Island from which bituminous rock is mined for road-making.

A leasing law, known as Philippine Law No. 2932, was approved in 1920 as a substitute to the old mining law. It limited the area to be leased to any individual to 400 hectares (988 acres), and to any association or company to 1200 hectares (2965) acres, and the term of the lease to five years. A wild stock market boom in Manila in 1934-36 brought about the establishment of numerous claims. However, the government later found most of the claims defective under the provision of the corporation law forbidding community of ownership. On review, a number of the claims were forfeited leaving only two, one in Tayabas and one in Northern Cebu which came into the possession of Far East Deveolpment Company.

Far East Development first undertook to develop the Tayabas lease, in the district where Standard of California had drilled. Using a local contractor operating with modified water-well equipment, the new company found a small amount of oil in upper strata but was unable to get down to the deeper horizons looked to for larger production.

A modern rig, designed to drill to 4000 feet, was obtained and testing of the large Danbatayan structure in northern Cuba was undertaken.

Far East found that the beds under the Danbatayan dome had thickened unprecedently. Having drilled 4000 feet without reaching the zone in which oil was expected, the rig was sold to National Development Company to drill the test on the shallow Barili structure. Far East then purchased a much heavier rig and started a new hole which was being drilled at the beginning of the war.

The Danbatayan structure is symmetrically anticlinal and the possible oil bearing strata, laid down in a sedimentary basin, are of great thickness, according to subsurface data obtained from cores of the formations drilled in the first hole in 1941. The entire Philippine group of islands lies northeast of the Island of Borneo where oil was discovered some 35 years ago.

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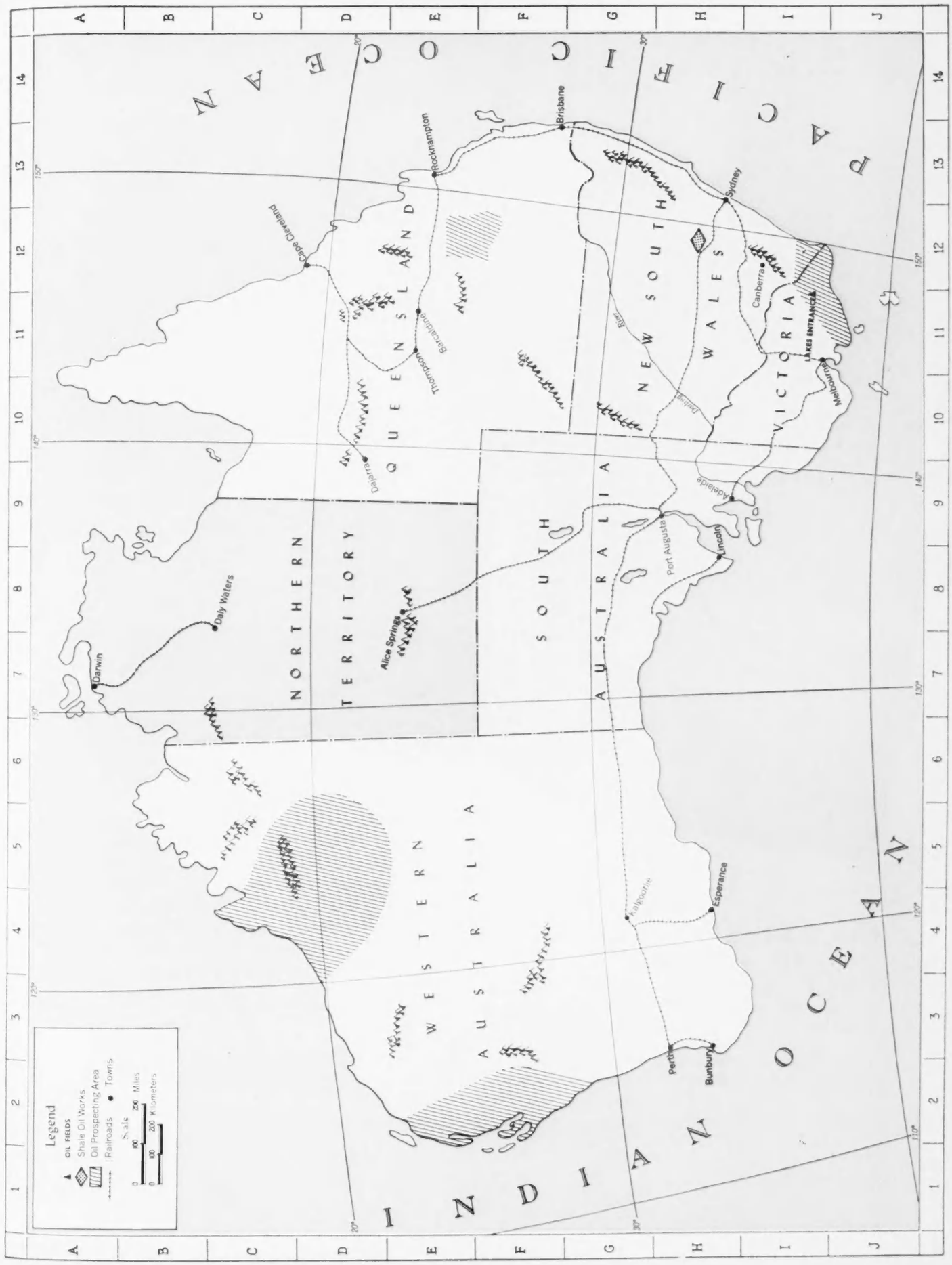
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AUSTRALIA

CONSIDERABLE expansion of the search for oil in Australia is planned immediately by both major oil companies and the Australian government.

The Shell Queensland Development Company, a Shell subsidiary, is credited with having allocated about $3 million to the further examination of the 60,000 square miles of concessions held in the southwestern part of Queensland.

Vacuum Oil Company, Ltd., the Australian subsidiary of Standard Vacuum Oil Company, has joined with D'Arcy Exploration Company, Anglo-Iranian subsidiary, and Zinc Corporation, Ltd., in formation of two new Australian companies for an intensive exploration campaign on the Australian continent. Vacuum geologists say that past geological and geophysical work has been inconclusive and plan a new program using latest methods and equipment.

Frome-Broken Hill Company, one of the new firms, will start work in a large area including parts of South Australia, Queensland and New South Wales. Bonaparte Gulf Company, Ltd., the other new company, will investigate the Northern Territory and Western Australia.

A group of four companies is expected to start work immediately in the Roma district of Queensland, where some small production has been previously obtained. These companies are Roma Blocks, Kalimna Oil, Australian Oil Development and Roma North Oil.

The Australian government is supporting an intensive exploration program, principally in Northwest Australia. Freney Kimberley Oil Company and Caltex Oil Company are leading operators in the search in the Nerrima Dome region. During the latter part of 1946 the Freney Kimberley company was drilling a wildcat test in the Jimberley district of Northwest Australia. The test was near 4300 feet.

Australia's oil production has been confined to the Lakes Entrance field in Victoria, at Gippsland, about 150 miles east of Melbourne. The discovery well was drilled in 1924 and flowed some methane gas along with a trace of oil in Tertiary beds. During the war Commonwealth and State governments spent about $800,000 in sinking a shaft between 1200 and 1300 feet deep. At the base of the shaft a chamber was excavated with the hopes of obtaining production by drilling holes horizontally into the sand. Recent reports indicate that Austral Oil Drilling Syndicate has resumed work on the shaft project. The pilot well was deepened five feet and yield increased from 40 pints to 40 gallons daily.

National Oil Ltd. during 1946 produced 4 million gallons of gasoline by distillation of New South Wales shales and this production is expected to be doubled in 1947.

Meanwhile, Australian refining facilities are being expanded. Vacuum Oil Company, Ltd., is nearing completion its 1300-barrel daily capacity plant at Paisley, about 14 miles from Melbourne. While it has been designed primarily as a lubricating plant, an asphalt unit also will be installed.

Bitumen and Oil Refineries, Ltd., a subsidiary of Caltex, will construct a refinery at Bunnerong in South Sydney to manufacture bitumen, gasoline and other products. Treating stock will be crude oil from Saudi Arabia and Bahrein.

Data on Australian Refineries

COMPANY	Location of Plant	Crude Charging Capacity	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
Commenwealth OilRefining Ltd.	Laverton	3500	None	Skimming	Operating
Newport Oil Refining Ltd.	Newport	100	None	Skimming	Operating
Shell Oil Company of Australia	Clyde	2750	1000	Skim-Crk	Operating
Vacuum Oil Company	Paisley	1300	None	Skimming	Building
Bitumen and Oil Refineries, Ltd.	Sydney		None	Skimming	Building
Total Operating	3 Plants	6350	1000		

NEW ZEALAND

EXPLORATION for oil in New Zealand, which reached a new peak during the war years, has slowed considerably with little activity reported during 1945 and 1946.

The only oil production obtained so far in New Zealand is from a few wells at Moturoa and Taranaki in Taranaki, North Island, and from the presently non-commercial Kotuku wells in Westland, South Island. Total production in 1942 was about 2050 barrels with a cumulative output as of December 31, 1942, of 77,750 barrels. Present production is almost nil.

The search for oil in New Zealand began around 1880 and up until 1924 many shallow wells were drilled close to gas and oil seepages. In 1924, Taranaki Oilfields, Ltd., was organized and conducted an extensive geological study of New Zealand. Seven tests were drilled by this company mainly on closed domes and anticlinal structure in Tertiary and late Cretaceous beds. The depth of these tests varied from 2000 feet to 5060 feet and all were dry holes.

After 1924, oil exploration in New Zealand was dormant until about 1936 when Taranaki Oilfields started new work. The search gained impetus in 1938 with passage of the New Zealand Petroleum Act. This act allowed companies to acquire land concessions and three companies were engaged in geological surveys followed by drilling from 1937 to 1944. During this period all the promising Tertiary sedimentary basins were geologically examined. Reflection seismic parties and gravity meter crews were active. As a result of the 1936-44 exploration 13 wells were drilled that varied in depth from 1100 feet to 10,925 feet. All were dry holes.

However, these tests revealed significant and anomalous results, for where geologists and geophysicists had predicted 7000 to 20,000 feet of Tertiary and late Cretaceous sediments, basement rock was struck at 1100 feet to 5000 feet in several tests. In other tests whole or parts of stratigraphic units were missing, and oil facies and objective sands were absent.

Of the 13 tests drilled, five struck "high" basement, two others drilled into volcanic sills, or the baked sediments adjacent to sills, and an eighth well penetrated high-angle or vertical beds to 7000 feet. The deepest test, 10,925 feet, was drilled on a reflection seismic "high" and almost certainly was down the flank, practically in a syncline. Possibly two wells drilled during 1937-44 could be regarded as fair tests. Both were drilled on closed domes on major uplifts, and both struck considerable gas.

During the war, Superior Oil Company of California, which had conducted extensive geological and geophysical explorations in New Zealand and had selected three prospects, drilled five tests for the Allied command before halting operations in March, 1943. All the tests were dry holes and ranged in depth from 2985 feet to 7100 feet. These tests were located on North Island and along the west coast of South Island.

The last wildcat test drilled in New Zealand was reported completed in November, 1944, as a dry hole. The test was New Zealand Petroleum Corporation's Notown 1 near Greymouth in Westland. Total depth was 6942 feet.

The deepest test, drilled to 10,925 feet, was located at Midhurst, southeast of New Plymouth in Taranaki.

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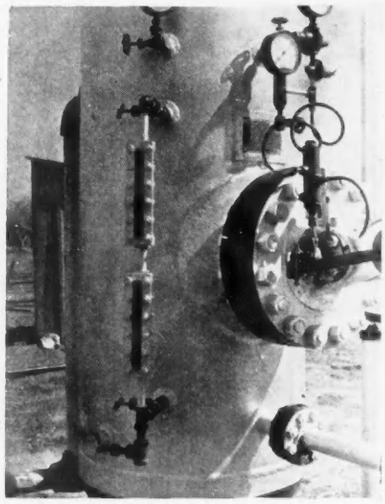

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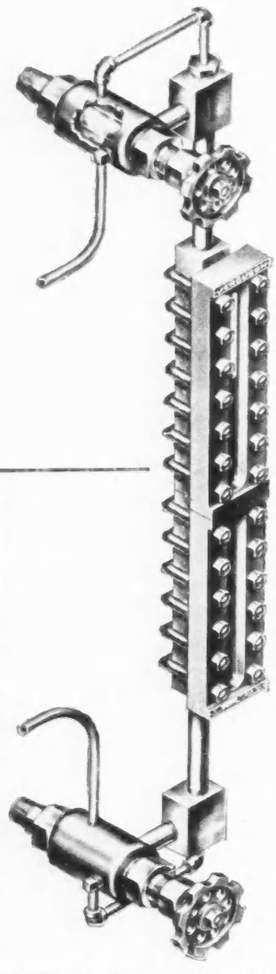

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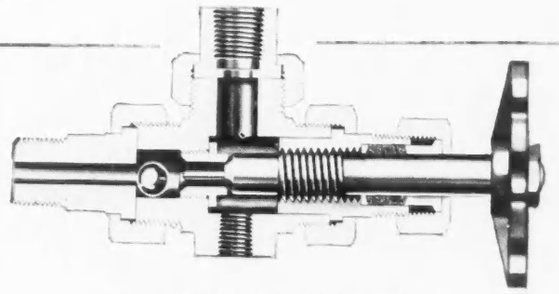

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The Original "Front End" Winch

Model 125 King Winch on Recording Truck

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King Winches are the original front end winches, having been first built by request of geophysical exploration crews. King Winches are designed for "front-end" mounting being constructed of fabricated steel where extreme strength is required and light weight is an important factor. Three sizes are available: Model 125 for 1½ ton truck, Model 120 for 1 ton truck, Model 100 and R-100 for ½ ton trucks and passenger cars.

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For King Front-end Winches A Friction Reversing Winch

Model R-100 King Winch for Willys Jeep

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The new KING Model R-100 Friction Reversing Winch fills the much needed field for a "Front-End" Winch that can be reversed by power. This is accomplished by a Pullmore friction clutch running in oil and assembled as an integral part of the winch housing. This enables a load to be lowered with safety and perfect control without the use of any other reversing mechanism such as a two-way power take-off.

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OTHER COUNTRIES

Denmark

A systematic oil exploration program is being carried out by Danish-American Prospecting Company, a Gulf Oil Corporation subsidiary, in Denmark and on the Danish islands.

The program includes geophysical work as well as surface mapping and core drilling. A seismic outfit has been doing refraction surveys, using the fan-shooting technique, and has located several interesting structures which core drilling down to depths of 1000 and 2000 feet has confirmed. These structures are west of Jutland and are definite salt uplifts which are probably a continuation of the German salt trends.

Danish-American has one rig active in the Jylland area near the German frontier and the test was last reported drilling in salt below 1200 feet. The company is to receive two complete new drilling outfits with which to carry on its exploratory drilling program.

The company's present staff numbers about 80 people but when deeper drilling operations are under way the staff will be increased to about 135 people.

Denmark is totally dependent upon imports for its crude oil supplies. A small refinery, with a capacity of about 150 barrels daily, is operated near Copenhagen.

Yemen

The independent Arab kingdom of Yemen, on the Red Sea, has opened negotiations with American petroleum producing companies looking toward a new and energetic program for the development of Yemen's oil resources. Yemen is on the southeast tip of the Arabian peninsula, with an area of 75,000 square miles. Terms covering leasing, royalties and operating conditions are being drawn up in the kingdom's capital, San'a.

Yemen's ruler, Imam Yahya, now past 80 years of age, encouraged by the success of his neighbor Ibn Saud, has instructed his ministers of state to have geologists prepare a complete report on Yemen's oil reserves.

The Italians, in 1924, were the first to inventory Yemen's oil possibilities but a blanket concession on the whole kingdom was refused. Dutch interests then investigated but decided that production and transportation costs would not justify a test. Later, a treaty was signed with the Russians, which is still in force. A Russian-Yemenite corporation was formed for prospecting in the region of San'a, but efforts failed and the joint company is now dormant. Next, American interests conducted a test in the Yemen mountains and asked, after that, a blanket concession. This was refused by the king. The ruler, however, has consented to exploit the oil resources jointly with the aid of American technicians.

Sweden

Traces of oil have been reported at 6230 feet in a wildcat test being drilled near Hoellviken, Sweden. Hoellviken is in the Skaane region, near Malmo, in the southwest corner of the country. So far no commercial accumulation of oil has been found in Sweden.

Sweden has large shale deposits at Kinnekleva (Vastegotland) and Kvarntorp (Narke). The yields of oil from the shale in these deposits are from 5 to 6 percent but the total resources are large. At the first locality, the deposits are estimated to contain 175 million barrels of oil. The Narke deposits located at Kvarntorp, having a higher oil content than the shales of Kinnekleva, are estimated to contain from 350 million to 420 million barrels of oil. During the war the capacity of the Kvarntorp shale oil refinery was increased from a production of 200,000 to 500,000 barrels of oil annually. It is planned to enlarge the capacity of the Kvarntorp plants to 800,000 barrels by improving the productivity of the oil shale retorts.

Crude oil refineries in Sweden are located at Stockholm and at Malmo. A large refinery now is being built at Gothenburg.

Proposals are afoot to build two pipe lines from Gothenburg to Stockholm. One would be an 8-inch line to transport heavy crude and the other a 4-inch gasoline line. Cost of the project will be 86 millions and it will take a year to complete. The lines as planned will be about 400 miles long, including two branch lines to the towns of Vasteras and Nynashamm.

Ethiopia

Sinclair Oil Corporation plans to complete its first test on its concession covering the 350,000-square-mile empire of Ethiopia by the latter part of 1948.

The first units of rotary drilling equipment capable of drilling to 15,000 feet will be shipped from the United States this summer.

In obtaining the concession, Sinclair will pay royalties to Emperor Haile Selassie in addition to building one or more schools and hospitals, clinics and research foundations. The company also will pay for educating a number of Ethiopians in the United States for the next 10 years. The concession is for 50 years.

French Equatorial Africa

Location for the drilling of a wildcat oil test in Gabon, a French colony in French Equatorial Africa, has been staked by Syndicat d'Etudes et de Recherches Petrolieres. Equipment for the drilling of this test was purchased in the United States. The test is expected to be spudded in the latter part of 1947. The French company carried out extensive geological work in Gabon during 1945 and 1946. The same company also carried on geological work in Madagascar during 1946.

Turkey

Discovery of oil in Turkey was reported during 1946 but was never confirmed. The well was reported completed at approximately 4000 feet near the Syrian frontier and is said to have flowed about 30 barrels daily of asphalt-base oil.

Although the Turkish government is anxious to develop oil reserves in the country it is reluctant to grant concessions to foreign oil companies. Several companies have applied for concessions but they were refused.

Meanwhile, the Turkish government is carrying out an exploration program of its own. Some light drilling and exploration units were shipped from the United States during 1946. Also, the Twentieth Century Fund, an institute for scientific research, is sponsoring a survey of the oil possibilities in Turkey. The work is being conducted by Max W. Thornburg. The study will also include what legislation might be needed to permit operations by foreign companies.

Spain

Spain's full-scale wildcat oil test will get under way in 1947. An American-made rig, capable of drilling to about 8000 feet, has been set up by Compania Espanola de Petroleos Scientificas Investigaciones, S.A., on the Oliana prospect, in the Province of Lerida, 60 miles northwest of Barcelona in the extreme northeastern part of the country. It is situated on the Segre River in the Ebro Basin at an altitude of approxmately 1500 feet. As presently mapped, the Oliana prospect is an anticlinal structure on which the Lower Tertiary is exposed so that sedimentary possibilities within

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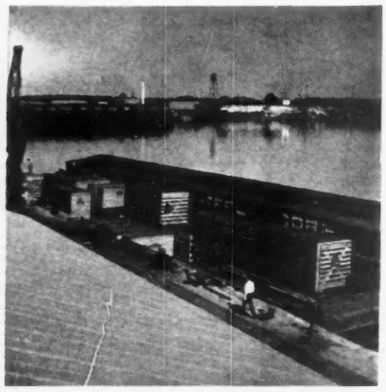

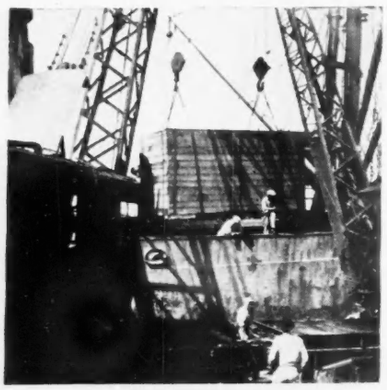

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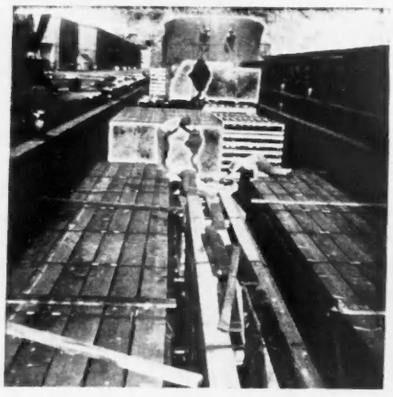

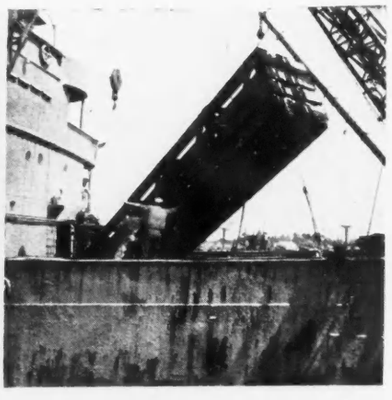

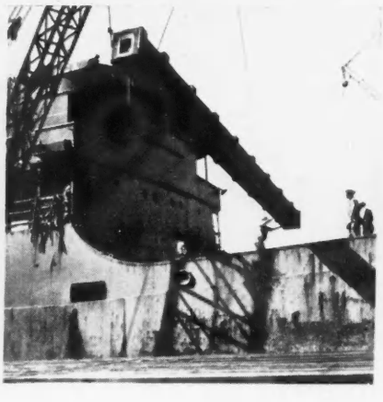

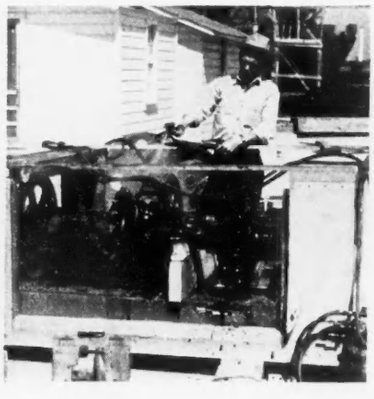

OTHER COUNTRIES—Continued

the range of the available drilling equipment will include the Tertiary and possibly older beds. No core drilling has been done.

Compania Arrendataria del Monopolio de Petroleo Sociadad Anonima (CAMPSA), a privately financed but government sponsored company, also is prospecting for oil in Spain. Current work centers around Burgos and Soria, north of Madrid. During 1946, CAMPSA core drilled about 2000 feet in its search for oil in Spain.

Nigeria

A joint exploration project was carried out in Nigeria, British West African colony, several years before the war by Anglo-Iranian Oil Company and the Shell Group.

Most of the exploratory work was done in the southern part of Nigeria, north of Port Harcourt. No suitable structures for drilling have yet been reported, but in view of the great thickness of gently folded Cretaceous and Tertiary sediments present in this area, the presence of oil is a reasonable supposition. There are tar sands and oil seeps in beds extending for some distance along the coast east of Lagos, but unfortunately these beds dip southward under the sea, so that down-dip exploration is not feasible.

Attention has been directed to the possibility of finding oil in the upper part of the Niger Delta area. Extensive geological and geophysical surveys have been carried out in this region, and further investigations are planned.

South Africa

Oil in commercial quantities has not been found in South Africa. However, the investigations carried out by the Department of Mines during recent years have included drilling of holes in rock of the Karroo System and have been aimed mainly at the acquisition of a better knowledge of the nature of these rocks at depths and their possibility of containing permeable layers which might be oil reservoirs. Oil shale or torbanite deposits are encountered on several horizons in the coal measures series (Middle Ecca) of the Karroo System, in the Bethal, Ermelo and Wakkerstroom districts of the Transvaal, and in the Utrecht and Dundee districts of Natal. The torbanite beds are generally found underlying or interbedded with seams of coal, but sometimes occur as separate seams not in association with oil. They are thin (6 inches to 5½ feet) compared with beds of torbanite or oil shale found in other parts of the world. A skimming plant with a capacity of 1000 barrels daily is operated at Emelo, Transvaal.

Portuguese East Africa

Portugal has recently granted concession rights to Manica Trust, Ltd., a British-Portuguese firm, to carry out geological and geophysical explorations in Mozambique, Portuguese East Africa. A considerable thickness of Mesozoic and Tertiary rocks occur in Mozambique. Several shows of oil and gas were found in shallow tests drilled as early as 1927 in the colony by the Inyaminga Petroleum, Ltd. (South African interests).

Bulgaria

The Bulgarian government is reported to have purchased from Sweden a drilling rig capable of drilling to 5200 feet for use in the Provadia district of Bulgaria. Reports say that investigations have indicated the probable existence of oil deposits in the Eastern Star Planina region of Bulgaria.

Shale deposits rich in petroleum are reported in the mountains of Prin.

Cyprus

Petroleum Development (Cyprus) Company, Ltd. (Iraq Petroleum subsidiary) has sent a number of British and U. S. geologists to Cyprus to carry out a complete geophysical survey of the island.

An earlier survey, made in the first years of the war, revealed possibilities of petroleum production.

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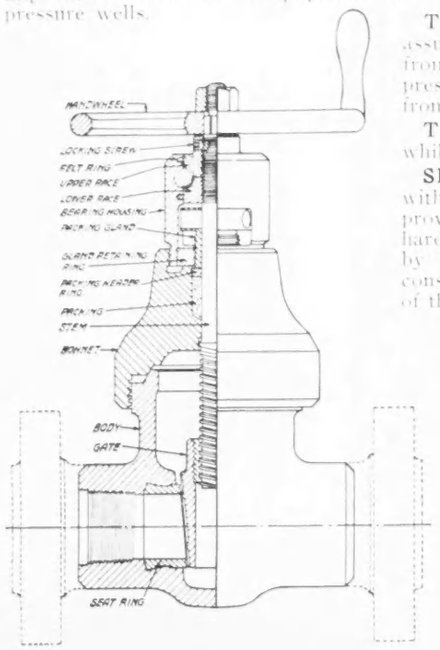
HUGHES BALL THRUST VALVES

Atlas Engineering Works has acquired for manufacture and sale to the oil industry the Hughes New Ball Thrust Valves. All machinery, inventory and other essentials will be housed by Atlas in a new building being erected.

In this valve the oil industry is assured of receiving the benefit of years of engineering research by the Hughes Tool Company in connection with the Atlas policy of constant improvement in all of its equipment for the control of high pressure wells.

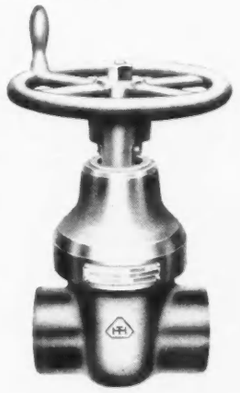
The same care as exercised by the Hughes Tool Company in producing high quality valves will be maintained by Atlas Engineering Works and stocks will be available for immediate delivery. These valves are made from carefully selected alloy steel, they are of the non-rising stem, solid wedge type, with ball-bearing stem thrust, hard-faced seating surfaces with either flanged or screwed ends.



THE STEM THRUST is rugged, heavy duty, steel ball-bearing, grease-packed to assure ease of operation. The external location of the ball thrust bearing protects it from possible injury by corrosive well fluids. The Valve is readily repacked under pressure, and if necessary the ball race can be replaced without removing the Valve from service.

THE STEM is made of heat-treated stainless steel to reduce the danger of corrosion, while the special "Acme" thread insures ease of operation and resists wear.

SEATING SURFACES on both Gates and Seats are faced with hard, stainless, non-galling alloy which field service has proven highly resistant to both corrosion and erosion. The hard-faced seat rings are expanded into the body recesses by hydraulic pressure. Laboratory tests have proven this construction rugged and leak-proof at pressures far in excess of the rated test.

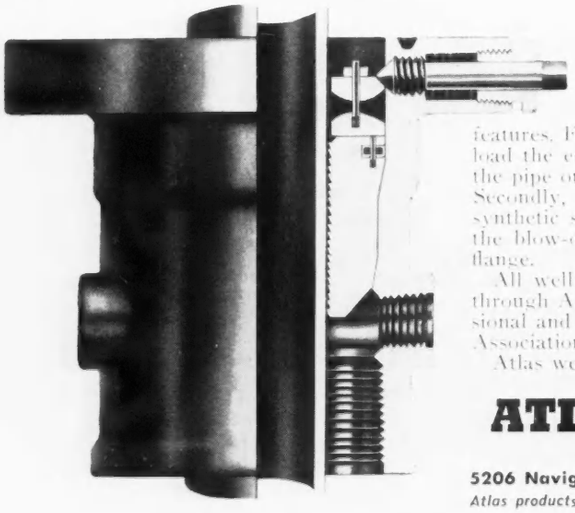


THE PACKING GLAND is enclosed. Adjustment of the improved packing is seldom necessary, but is readily made by inserting a round bar through the slotted ball race housing into holes of ample size provided in the packing gland.

THE BONNET is a one-piece forging with ground joint connection to the body. It is given a special chemical treatment which resists corrosion and prevents galling or scoring of the sealing surface.

THE HAND WHEEL is provided with a handle for convenience and easy operation.

ATLAS TYPE H.S.W. WELL HEAD



The Atlas Engineering Works in keeping with the continuous improvements in oil field equipment announces that their entire line of equipment has always had three basic principles in design, viz.: Safety, Simplicity and Durability. Every piece of equipment has been given thorough engineering study so that the ultimate in performance has been achieved.

The Atlas type H.S.W. casing head embodies two important features. First, the double tapered slips which insures perfect alignment of pipe load the entire length of slip surface. This eliminates the hazard of crushing the pipe on the long heavy strings now being used in the deep wells of today. Secondly, the sealing member composed of two steel back up plates with a synthetic sealing rubber between, is easily placed in the casing head through the blow-out preventers and locked in place by lock screws in casing head flange.

All well heads are full casing opening allowing the setting of all hangers through API flanged blow-out preventers. All flanges are made to both dimensional and material specifications of the American Petroleum Institute and the Association of Well Head Equipment Manufacturers.

Atlas well head equipment is available in all types, sizes and pressure ranges.

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* The asterisk indicates that detailed information on products and services of the firm will be found in current 15th (1946-47) edition of The Composite Catalog of Oil Field and Pipe Line Equipment.

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*Reed Roller Bit Co. 4-5-6
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*Waukesha Motor Co. 208
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*Well Equipment Mfg. Corp. IV Cover
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The Youngstown Sheet & Tube Co. 164
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John Zink Co. 116
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Bigger Pay-off ON PRODUCTION JOBS!

PATTERSON-BALLAGH PRODUCTION TOOLS PROVE POPULAR WITH PRODUCTION MEN.

DEEP WELL SWABS
For Tubing or Casing

FOR MORE POSITIVE SWABBING

Field production men like the dependability of Patterson-Ballagh's Deep Well Swab for swabbing away to a good start. It saves time and money in getting a well on production. Two years' field testing with top production crews taught us much about the better swabbing methods. You may find these facts useful to you. . . . Write for Patterson-Ballagh Booklet No. 340.

PLASTIC TUBING PROTECTORS

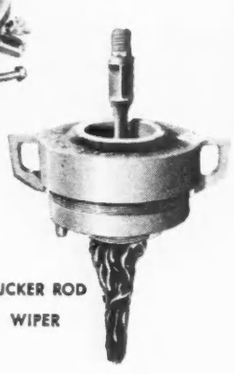
SUCKER ROD PROTECTORS

FOR FEWER WELL PULLING JOBS

When a well goes on the pump, the job is to keep it pumping. Tubing failure, due to friction caused by rod and pump pulsation is a constant cause of well pulling jobs. Patterson-Ballagh's Sucker Rod Protectors are specially designed to stop wear inside the tubing. The patented Plastic Tubing Protector, described in Booklet No. 180, saves wear between tubing and casing. At a small cost, these tubing savers reduce the number of expensive well pulling jobs.

TUBING WIPER

WIRE LINE WIPER



SUCKER ROD WIPER

FOR CLEANER, SAFER AND QUICKER WELL PULLING JOBS

As long as pumping wells are being operated, well pulling still has to be done. Costly rig-clean-ups and crew discomforts can be avoided with Patterson-Ballagh Sucker Rod, Tubing and Wire Line Wipers. These three favorites do the dirty work and keep the oil down the hole where it pays. Crews and equipment stay clean and work is safer. Booklets No. 180, No. 310, and No. 330 give you complete information on the use of Patterson-Ballagh Wipers for *Production Profit Protection.*

Write for the 1947 Patterson-Ballagh General Catalog and also see your Patterson-Ballagh man for a demonstration.

Specify

PATTERSON-BALLAGH

DIVISION OF BYRON JACKSON CO.

"Best Bet Yet"

OIL FIELD PRODUCTION SPECIALTIES

Main Office:
1900 E. 65th St.
Los Angeles 1

★

6247 Navigation Blvd.
Houston 11

★

808 Graybar Blvd.
New York 17

★

921 Russ Bldg.
San Francisco 4

Swifter—Surer—Safer

FOR DEEPER DRILLING

Drilling men set new records daily for speed and depth as the years go by. Every Patterson-Ballagh product has played an important part in helping them make faster progress with less failure from avoidable wear and tear on equipment.

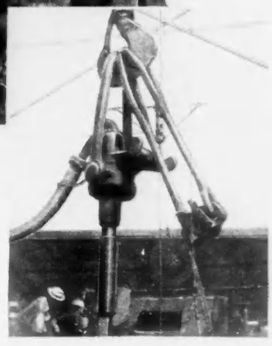
THE DEAD-LINE STABILIZER
stops wear of dead-line against finger board . . . vibration dampener used above weight indicator, increasing its life and accuracy.

TRAVELING BLOCK BUMPERS
save loss of time and costly repairs if a block accidentally runs into the crown.

CASING PROTECTORS AND DRILL PIPE STABILIZERS
lower torque, save power, save wear on casing and drill pipe, increase R.P.M. and make drilling faster.

SWIVEL BAIL BUMPERS

keep elevator bails from pounding the swivel . . . save wobble, wear and repair costs.

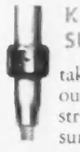


INSTALLATION EQUIPMENT
and handling tools simplify putting Patterson-Ballagh Drilling Specialties to work for you.

WIRE LINE GUIDES
damp vibration in the wire line . . . save kinking, tangles and shock fatigue of rig.

KELLY WIPERS
keep the grief stem clean . . . free the rollers of grit and grime . . . improve weight indication.

PIPE WIPERS
keep crew, rig and premises clean . . . save mud and weight material . . . make drill pipe handling safer.



KELLY SUB STABILIZERS
take wobble and whip out of kelly . . . insure straighter hole . . . save surface string.

MUD GUNS
make control of mud easier, more automatic and accurate . . . most effective for mixing and agitating.

THREAD PROTECTORS
are a popular new item for saving thread damage. Like all new Patterson-Ballagh products to come, they will help to make oil field operations Swifter, Safer and Surer. For full specifications on all items, send for your free copy of the 1947 Catalog.

Specify

PATTERSON-BALLAGH

DIVISION OF BYRON JACKSON CO.

"Best Bet Yet!"

OIL FIELD DRILLING SPECIALTIES

Main Office:
1900 E. 65th Street
Los Angeles 1

★ 6247 Navigation Blvd.
Houston 11

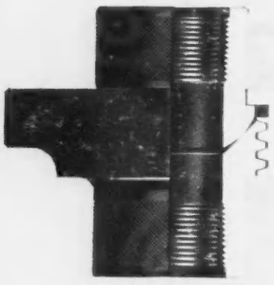
★ 808 Graybar Bldg.
New York 17

★ 931 Russ Bldg.
San Francisco 4

THESE "TOP HANDS" WEAR THE WECO BRAND OF QUALITY!

SNATCH BLOCKS

ANCHOR GAS BURNERS

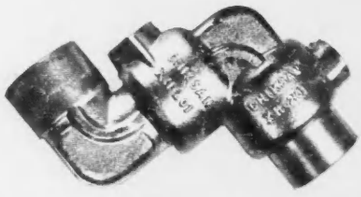


WING UNIONS

OKADEE VALVES

WECO

TRADE MARK REG.



CHIKSAN SWIVEL JOINTS, CIRCULATING HEADS, MUD GUNS AND STEEL ROTARY HOSE

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EVERY product manufactured and distributed by WECO is the result of many years of experience in the field. Without exception, products that bear the WECO Brand of Quality are entirely free of theoretical features that prove impractical in actual service. WECO Products are built up to an unexcelled quality standard to give you longer, trouble-free service. And when you try any WECO Product, you'll find why many operators agree WECO Products are "top hands" in the oil country. They are WECO Quality . . . tops in any field.

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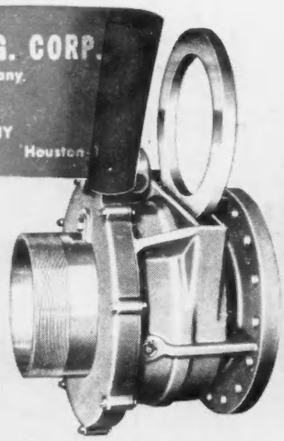
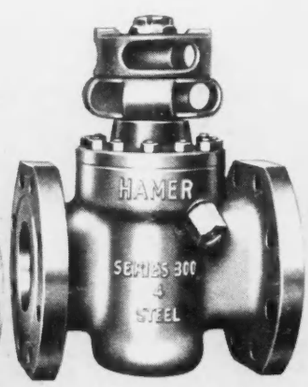


HAMER LINE BLINDS



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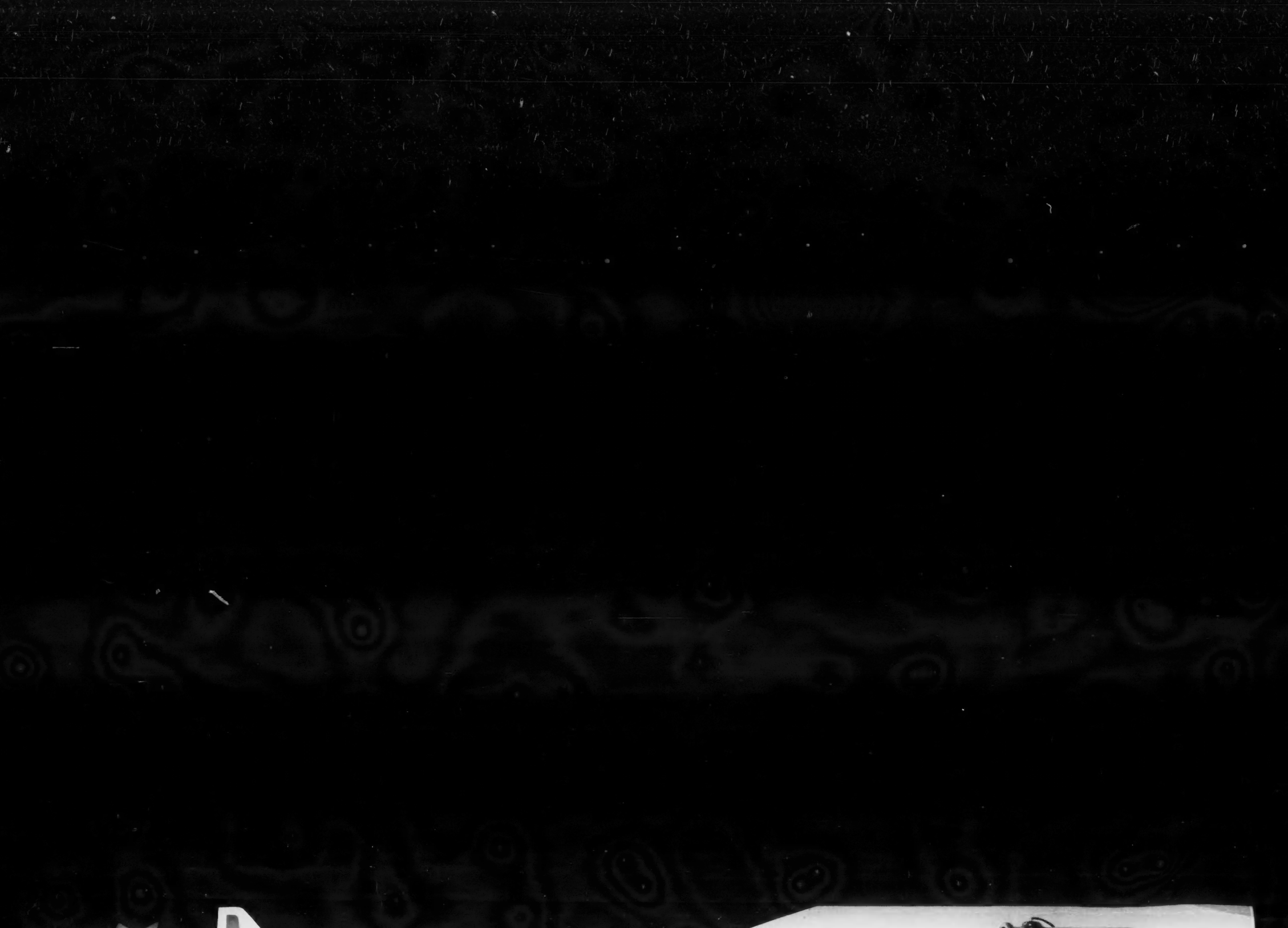
TOOL JOINT DOPES